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FINAL SITE MANAGEMENT PLAN
ALABAMA ARMY AMMUNITION PLAN
TALLADEGA COUNTY, ALABAMA

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Table of Contents

<u>Section</u>	<u>Page No.</u>
1.0 Purpose and Scope	1 - 1
2.0 Site History and Background	2 - 1
2.1 Physical Setting	2 - 1
2.1.1 Physiography and Topography	2 - 1
2.1.2 Climatology	2 - 1
2.1.3 Geologic Setting	2 - 2
2.1.4 Surface Hydrology	2 - 2
2.1.5 Soils	2 - 3
2.1.6 Groundwater	2 - 3
2.1.7 Ecological System	2 - 3
2.2 Facility History	2 - 4
2.3 Land Usage	2 - 5
3.0 Summary of Existing Studies	3 - 1
4.0 Area A Site Descriptions	4 - 1
4.1 Study Area 11 - Magazine Area	4 - 1
4.2 Study Area 12 - Old Burning Ground	4 - 1
4.3 Study Area 13 - Small Arms Ballistics Range	4 - 2
4.4 Study Area 14 - Cannon Range	4 - 2
4.5 Study Area 15 - Old Well	4 - 3
4.6 Study Area 17 - Propellant Shipping Area	4 - 3
4.7 Study Area 30 - New Trench Area	4 - 4
4.8 Study Area 31 - Disposal Area	4 - 4
4.9 Study Area 29 - Rubble Pile and Study Area 32 - Number 2 Rubble Pile	4 - 4
4.10 Study Area 33 - Henningburg Area	4 - 5
4.11 Study Area 34 - 229 Area	4 - 5
5.0 Area B Site Descriptions	5 - 1
5.1 Study Area 2 - Smokeless Powder Facility	5 - 1
5.2 Study Area 3 - Sanitary Landfill	5 - 2
5.3 Study Area 4 - Manhattan Project Area	5 - 4
5.4 Study Area 5 - Red Water Storage Basin	5 - 5

TABLE OF CONTENTS

(continued)

<u>Section</u>	<u>Page No.</u>
5.5 Study Area 6 - Southern TNT Manufacturing Area	5 - 6
5.6 Study Area 7 - Northern TNT Manufacturing Area	5 - 8
5.7 Study Area 8 - Acid/Organics Manufacturing Area	5 - 9
5.8 Study Area 9 - Aniline Sludge Basin	5 - 11
5.9 Study Area 10 - Tetryl Manufacturing Area	5 - 15
5.10 Study Area 16 - Flashing Ground	5 - 17
5.11 Study Area 17 - Propellant Shipping Area	5 - 20
5.12 Study Area 18 - Blending Tower Area	5 - 22
5.13 Study Area 19 - Lead Remelt Facility	5 - 23
5.14 Study Area 20 - Rifle Powder Finishing Area	5 - 24
5.15 Study Area 21 - Red Water Ditch	5 - 25
5.16 Study Area 22 - Demolition Landfill	5 - 28
5.17 Study Area 25 - Storage Battery/Demolition Debris	5 - 30
5.18 Study Area 26 - Crossover Ditch	5 - 31
5.19 Study Area 27 - Beaver Pond Drainage System	5 - 33
5.20 Industrial Sewer System	5 - 36
5.21 TC4A, TC4B & Concrete Slab - Stockpile Soils	5 - 36
5.22 Additional Areas Identified by the Community Environmental Response Facilitation Act (CERFA) Investigation	5 - 37
5.22.1 Building 6-Coke Oven	5 - 37
5.22.2 Downed Utility Poles with Transformers and Transformer Storage Buildings	5 - 38
5.22.3 Underground Storage Tanks and Gas Stations	5 - 39
5.22.4 Pesticide Storage Building	5 - 40
5.23 Summary of 1995 Supplemental RI Groundwater Results	5 - 41
5.24 Summary of 1995 Supplemental RI Results for Talladega Creek and the Coosa River	5 - 44
5.24.1 Talladega Creek	5 - 44
5.24.2 Coosa River	5 - 45
5.25 Summary of 1995 Supplemental RI Biota Results	5 - 46
6.0 Off Post Pathways of Concern	6 - 1
6.1 Existing or Potential Pathways of Contamination Migration	6 - 1
6.2 Environmental Concerns from Adjacent and Surrounding Properties	6 - 1
7.0 Future Land Use Scenario	7 - 1
7.1.1 Area A	7 - 1
7.1.2 Area B	7 - 1
7.2 Adjacent and Surrounding Properties	7 - 1

TABLE OF CONTENTS

(continued)

7.3	Land Reuse Scenarios	7 - 2
7.3.1	Area A	7 - 2
7.3.2	Area B	7 - 2
8.0	General Approach	8 - 1
8.1	Programmatic Strategy	8 - 1
8.2	Implementation Strategy	8 - 1
8.2.1	Area A	8 - 1
8.2.2	Area B	8 - 1
8.3	Scheduled General Activities	8 - 2
8.4	Detailed Description of Planned Activities	8 - 3
8.4.1	Area A	8 - 3
8.4.2	Area B	8 - 4
8.5	Interim Action Program Elements	8 - 5
8.6	Removal Actions	8 - 5

List of Tables

8-1	Area A Soils and Groundwater (Area A OU1) Programmatic Schedule
8-2	Areas 12 and 30 Interim Response Action (Area A OU2) Programmatic Schedule
8-3	Area B Soils and Groundwater (Area B OU1) Programmatic Schedule
8-4	Stockpiled Soils (Area B OU2) Programmatic Schedule
8-5	Areas 6, 7, 10, 21 and ISS Interim Soil Response (Area B OU3) Programmatic Schedule
8-6	Areas 2, 10, 16, 17, 19 and 22 Interim Soil Response (Area B OU4) Programmatic Schedule

General Location Map

Study Area Maps

- Study Areas within Area A
- Study Areas within Area B

List of Figures

8-A	Area A Soils and Groundwater (Area A OU1)
8-B	Area B Soils and Groundwater (Area B OU1)
8-C	Areas 6, 7, 10, 21 and ISS Interim Soil Response (Area B OU3)
8-D	Areas 2, 10, 16, 17, 19 and 22 Interim Soil Response (Area B OU4)

1.0 Purpose and Scope

This Site Management Plan (SMP) addresses the plans and strategies of the U.S. Army, U.S. Environmental Protection Agency Region IV, and Alabama Department of Environmental Management to investigate and remediate the Alabama Army Ammunition Plant (ALAAP), Childersburg, AL. The SMP provides background information on the ALAAP and describes the projected future actions needed to establish permanent remedies at the facility, including closure and monitoring requirements. The SMP is based on previous and on-going investigations at the facility. This SMP represents the best-available projections regarding known and potential sources of contamination and impact areas, and potentially feasible remedies leading to complete and final contamination control and/or cleanup actions at the facility. The SMP had been updated annually to reflect work in progress; additional work to be conducted; changes in schedules; and new information or requirements (site or regulatory related). With the planned transfer of the property to the City of Childersburg, it is anticipated that this will be the final issuance of this report.

All investigations and remedial actions at ALAAP have been conducted in accordance with the 1989 Federal Facility Agreement between the U. S. Army, the U. S. Environmental Protection Agency (EPA), and the State of Alabama.

The SMP addresses areas (Study Areas) known or suspected to be contributing to environmental contamination at ALAAP. These Study Areas contain sites used for the manufacture and testing of, burial, detonation, burning and other types of disposal of ordnance materials and other support and hazardous substances. Environmental studies conducted since 1980 have shown that releases of hazardous substances have occurred from the source areas, resulting in contamination of groundwater and other media that may have ultimately posed unacceptable health or environmental risks. Cleanup in one portion of the property (Area A) has been completed and a final Record of Decision has been approved. Soils on the property retained by the Army (Area B) have been remediated to allow for industrial reuse of the property. Current data shows that groundwater contamination originates from several source areas, and investigations to determine the full nature and extent are continuing.

2.0 Site History and Background

2.1 Physical Setting

ALAAP is located in Northeastern Alabama (Talladega County), approximately 40 miles east-southeast of Birmingham and 70 miles north of Montgomery, the state capital. The nearest town is Childersburg, Alabama, four miles south of ALAAP (**General Location Map**). The plant was established in 1941 on 13,233 acres of land near the junction of Talladega Creek and the Coosa River. The terrain is level to rolling and largely suited to pasture and timber, with elevations ranging from 384 to 600 feet above mean sea level (feet-msl).

2.1.1 Physiography and Topography

All of ALAAP is in the Coosa Valley district of the Valley and Ridge physiographic province (Fenneman, 1938; Johnston, 1933). The border between the Valley and Ridge province and the Piedmont province is south of ALAAP between Talladega and Tallaseehatchee Creeks.

Topography within ALAAP generally ranges from remnant river floodplain over the western portion of the site (Area B) grading to wooded uplands over the eastern portion of the site (Area A). Elevations range from approximately 400 ft.-msl near the Coosa River to over 550 ft.-msl within Area A. Much of the topography was modified to accommodate farming activities prior to site construction, and then again during the construction and operation of the site.

2.1.2 Climatology

Talladega County's climate (including ALAAP) is temperate. The weather during fall, winter, and spring is controlled by frontal systems and contrasting air masses. Summer weather, which lasts from May or June, through September or October, is almost subtropical because maritime tropical air prevails along the Bermuda high-pressure system.

Average daily temperatures at Talladega are 75 degrees Fahrenheit (°F) for the high and 50°F for the low. Summer high temperatures are commonly 90°F or above; occasionally, maximum temperatures exceed 100°F. Temperatures below 32°F occur approximately 60 days per year, primarily in December and January.

Mean annual rainfall is 52 inches. The lowest average monthly rainfall (2.2 inches) occurs in October, and the highest average monthly rainfall (6.4 inches) occurs in March. The rain producing mechanism varies between the summer and winter seasons in Talladega County. The winter rainy season is from December to April, and the majority of rain is associated

September, with the highest rainfall occurring in June and July. Summer rains are normally associated with convective thundershowers.

2.1.3 Geologic Setting

The bedrock underlying ALAAP has been mapped on a regional scale and has been identified as undifferentiated Knox Group of Upper Cambrian to Lower Ordovician age dolomite. The dolomite underlying ALAAP is thick-to medium-bedded, cherty, and penetrated by numerous solution cavities, joints, and fractures. It is overlain by residual soil derived from it by weathering processes. This soil matrix consists primarily of clay, with some silt, sand, and occasional chert boulders, and varies in thickness from less than three feet to over 90 feet.

There appears to be a difference in the nature of the uppermost bedrock between the western and eastern portions of the site. Well borings completed in the eastern portion of the site (Area A) revealed a very weathered surface with a large number of horizontally trending rock ledges and cavities. Borings completed in the western portion of the property near the Coosa River (Area B) typically do not have this highly weathered zone. The top of the weathered bedrock is located at a higher elevation in Area A than the top of the solid bedrock in Area B. This highly permeable, horizontal weathered zone has likely been eroded from the bedrock in Area B, possibly by the action of the Coosa River.

2.1.4 Surface Hydrology

The majority of the surface runoff from ALAAP drains either west or southwest into the Coosa River. A portion of the southern and eastern side of ALAAP drains toward Talladega Creek, a tributary of the Coosa River. Prior to construction of ALAAP, the area consisted of farms, woodlands, and seasonally wet topographic low areas. Much of the western half of ALAAP was poorly drained at the time of plant construction. Small natural drainages were enlarged and re-routed to provide drainage at the sites of the various manufacturing operations.

During plant operation, two drainage systems within Area B conveyed surface runoff from the plant west to the Coosa River. Liquid industrial wastes from the explosives manufacturing operations were conveyed west to the Coosa River by a man-made channel, the Red Water Ditch (Study Area 21). Natural site surface runoff was conveyed to the Coosa River through the Crossover Ditch (Study Area 26). No natural ponds existed on the operational portion of the ALAAP property during its operation. Two large storage lagoons (Red Water Basin, Study Area 5, and the Aniline Sludge Basin, Study Area 9) were constructed to retain industrial wastes. Extensive wooded swamp and open pond areas have developed in the drainage systems at ALAAP since the beginning of demolition activities in 1973, primarily as a result of natural sedimentation and damming of drainages.

by beavers. Two surface impoundments (Beaver Ponds) have developed between the Northern and Southern TNT Manufacturing Areas (Study Areas 6 and 7). These ponds drain to the Coosa River through the Beaver Pond Drainage System (Study Area 27).

2.1.5 Soils

The soils at ALAAP are generally divided into three associations. Soils of the Bodine-Minvale association are found on the high ground of the eastern portion of ALAAP. This association is composed of deep, well-drained, steep, cherty, medium-textured soils derived from limestone and dolomite. Most of ALAAP is covered by soils of the Decatur-Dewey-Fullerton association, which are also deep, well-drained, loam soils derived from limestone and dolomite. The soils of the floodplain of Talladega Creek and the Coosa River have been classified as the Chewacla-Chenneby-McQueen association. These are deep, nearly level, alluvial loam soils that grade from somewhat poorly drained to well-drained and are subject to flooding.

These broad-based associations represent agricultural classifications rather than engineering descriptions. Soil constitution within the three associations may range from soils consisting primarily of sand and silt with little clay to soils comprised almost entirely of clay.

2.1.6 Groundwater

Potable groundwater from the dolomite aquifer of the Coosa Valley supplies the needs of the communities, homes, farms, and industries around ALAAP. The majority of the successful wells draw water from solution cracks and cavities in the dolomite. A few wells are completed in the residual soil, but these wells are less productive than those drilled into the dolomite.

Various site specific potentiometric maps of the installation have been developed as a part of the remedial investigations. An inventory of domestic wells in the vicinity of ALAAP was completed during the RI and is presented in the final 1986 RI Report (ESE, 1986). This survey is being supplemented with data currently being collected by ADEM and SAIC. Potable wells in the vicinity of ALAAP were initially sampled during the Supplemental RI for Area B in 1991 (ESE, 1991) and additional testing is being completed in association with the ongoing groundwater investigation and the results will be included in the Final RI for Area B Groundwater report.

2.1.7 Ecological System

The environment at ALAAP has sustained three major perturbations in the past 40 years. Prior to construction of the facility, the area consisted primarily of cropland and woodland. During its operational years, much of ALAAP consisted of maintained industrial areas. A

woodland management plan, instituted after the cessation of operations, extensively modified ALAAP by allowing for the planting of 3,411 acres of controlled pine forest. The third major change occurred as a result of demolition of the industrial production areas.

Currently, many of the formerly maintained drainages, pine plantations, and cleared areas have undergone considerable vegetative overgrowth. Much of the planted pine has been harvested, and reforestation has occurred through natural revegetation. Impoundment of surface drainages by beavers has modified the drainage systems; drainage has become much slower, and extensive wooded swamp and shallow pond areas have developed. As a result of these changes, the major ecological systems currently consist of the following types: grassland/old field association, upland pine forest/pine plantations, oak forests, low moist pine woods, hardwood swamps, intermittent streams, shallow ponds, and drainage ditches.

These systems support abundant populations of aquatic and terrestrial organisms. White-tailed deer, introduced in the 1960s, have become abundant, as have certain predators (the red-tailed hawk, the marsh hawk, and the bobcat).

The extensive development of shallow beaver ponds has resulted in large populations of amphibians and aquatic reptiles, and the East Beaver Pond provides roosting for waterfowl. Extensive testing of habitat has been completed during the RI process.

2.2 Facility History

The Alabama Army Ammunition Plant was built in 1941 and operated during World War II (WWII) as a government-owned/contractor-operated (GO/CO) facility by E.I. du Pont de Nemours & Co. to produce nitrocellulose (NC), single-base smokeless powder and tetryl, trinitrotoluene (TNT), and dinitrotoluene (DNT). Activities at ALAAP also included the manufacture of the chemicals sulfuric acid (H_2SO_4), aniline, diphenylamine, and N,N-dimethylaniline; recycling of spent acids; and the disposal of wastes resulting from these operations. Operations were terminated at ALAAP in August 1945, and the plant was converted to standby status. At that time, large portions of the property which were never developed by the Army were returned by sale to their original owners or sold to other buyers.

The plant was maintained in various stages of standby status until the early 1970s. In 1973, the Army declared ALAAP excess to its needs. In the same year, the General Services Administration (GSA) declined to accept 1,620 acres of the former manufacturing area because the area could not be certified free from contamination. In 1977, a 1,354-acre parcel was sold to the Kimberly Clark Corporation.

To facilitate the release of the remainder of the property, ALAAP was divided into two major regions: Area A and Area B (see **General Location Map**). Area A consists primarily of the former storage areas, while Area B consists of manufacturing areas. In 1990, Area A was sold to private concerns who currently retain title to the land.

2.3 Land Usage

Area A was auctioned on May 10, 1990, and was conveyed to the new owners on August 31, 1990 for unrestricted use. Currently Area A is used as a hunting preserve and occasional logging.

Area B is currently in an inactive caretaker status with controlled access. The only activity occurring on ALAAP is occasional Army-supervised logging and the environmental investigations and remedial actions.

The land surrounding ALAAP is a mixture of recreational and industrial activity. ALAAP is bordered on the west side by a country club and the Coosa River; on the south by a paper products company; on the east by wooded, private property; and on the north by a water treatment plant and light industry.

3.0 Summary of Existing Studies

The Studies described in the following text are primary source documents used in the investigation of ALAAP. Full copies of each of the listed reports are in the Administrative Record and are available for viewing at the Childersburg Public library.

Installation Assessment of the Alabama Army Ammunition Plant, Report Number 130 (May, 1978) - This report (which consisted of a records search) was prepared to document previously suspected areas of contamination and to determine whether other (undocumented) contaminated areas exist. It concluded that areas were potentially contaminated with chemical and explosive manufacturing wastes, including TNT, DNT, trinitrophenolmethylnitramine (tetryl), smokeless powders, acid/organic compounds, and metals. In addition, the report indicated that due to past disposal practices (discharge of explosive contaminated waters into the Red Water Ditch), there is the potential for contaminated surface runoff during inclement weather. Finally, the report indicated that the installation was potentially contaminated with lead compounds and asbestos that were dispersed when buildings were demolished by burning and bulldozing.

Environmental Survey of the Alabama Army Ammunition Plant (July, 1981) - The purpose of the survey was to identify the nature and extent of contamination due to past operation in order to release the ALAAP as excess property. Such release requires certification that the released property is free from contamination and may be released without restrictions imposed. In order to establish priorities for releasing ALAAP, the Army originally divided the property into three areas: the Industrial Area, Leaseback Area, and the General Services Administrative (GSA) Area. The Industrial Area was the central portion of the plant used in the production of high explosives. The Leaseback Area included the nitrocellulose and smokeless powder production lines and associated facilities. The remainder of the installation, the GSA Area, included the former plant administration facilities, storage and shipping facilities, the magazine area, the cannon range, and the small arms ballistics range.

Sampling and analysis of groundwater, surface water, sediments, soils, buildings, and industrial sewers were conducted. Explosives-related contaminants were detected in all environmental matrices, including the groundwater in the center of the explosives manufacturing area. Sampling found no evidence of contamination in the surface drainage beyond the boundaries of Alabama Army Ammunition Plant. Principal organic contaminants were TNT, tetryl, 2,4-DNT, and 1,3,5-trinitrobenzene. Lead and asbestos contamination was also detected in the soils. Many of the buildings that remained standing contained asbestos with trace levels of nitrocellulose contamination and/or high explosive residues.

The industrial sewer system was also identified as contaminated with nitroaromatic compounds.

Confirmatory Environmental Survey, Alabama Army Ammunition Plant (June 1983) -

The purpose of the confirmatory survey was to more precisely define the extent of contamination in the Industrial Area and part of the GSA, as well as, characterize the hydrogeology of the site. The confirmatory survey conveyed the following findings:

- ▶ A single aquifer system occurs in the subsurface of the southern and northern TNT Manufacturing Areas with groundwater movement northwest toward the Coosa River.
- ▶ Nitroaromatic residues were present in the soils of the Southern and Northern TNT Manufacturing Areas and the sediments in the Red-Water Ditch Area.
- ▶ Surface water from the Southern and Northern Manufacturing Areas did not contain nitroaromatics contaminants above applicable levels beyond the boundary of ALAAP.
- ▶ The concentration of nitroaromatics in the groundwater were estimated to be below applicable water quality standards by the time the contaminants would migrate to the Coosa River.
- ▶ The surface water in the Beaver Pond Drainage System were being impacted by nitroaromatics. However, the levels of contaminants in the stream were below applicable criteria.

Alabama Army Ammunition Plant Remedial Investigation Report (July, 1986) - The Remedial Investigation Report presented data collected during associated field investigations and summarized data collected from the two previous surveys. This summary included the hydrologic conditions of the site and quantified the extent of contamination in soil, groundwater, surface water, sediments, and sewer lines. The Remedial Investigation survey yielded or confirmed the following:

- ▶ No significant contaminant migration was identified in the surface or groundwater as a result of past industrial activities in 19 study areas.

- ▶ Sediments of the three major drainage systems (Beaver Pond drainage system, Crossover Ditch, and Red Water Ditch) were contaminated with nitroaromatic compounds.
- ▶ Runoff from the Red Water Ditch dredging spoil piles and occasional discharge from contaminated sewer lines present the potential for continued contamination of the waters of the Red Water Ditch.
- ▶ Nitroaromatic contamination existed in the shallow groundwater beneath the southern and northern TNT manufacturing areas.
- ▶ As a result of explosives manufacturing activities and subsequent demolition of buildings, the soils of the southern and northern TNT manufacturing areas and the old burning ground and sediments of the Red Water Ditch contain nitroaromatic residues.
- ▶ All soils tested for explosive reactivity were found to be nonreactive.
- ▶ Extractable lead above the extraction procedure toxicity limit was detected in soil at the lead remelt facility.
- ▶ Asbestos materials were scattered over all areas where buildings were demolished. The sanitary landfill and the demolition landfill also contained asbestos.

Alabama Army Ammunition Plant Area A Remedial Actions Final Report (February, 1988) - Following completion of the 1986 RI/FS, Weston Services, Inc. was contracted to complete remedial actions within Area A to facilitate release of the property. Actions completed included the removal of contaminated soil from 5 study areas which were identified in the RI (Old Burning Ground, Propellant Shipping Area, Magazine Area, Small Arms Ballistics Range and the Old Well). Underground storage tanks (heating oil) were also removed from two locations (Cannon Range and the Small Arms Ballistics Range). During site activities an additional 6 areas of local contamination were discovered and remediated. These areas (Rubble Pile, New Trench Area, Disposal Area, No. 2 Rubble Pile, Henningburg Area and the 229 Area) appeared to be localized dump sites associated with the demolition of the plant rather than having resulted from plant operations. Contaminated soils were transported to a containment facility within Area B to be remediated at a later date. Asbestos materials were transported to the asbestos repository also located within Area B.

Supplemental RI/FS for Area B, Alabama Army Ammunition Plant (October, 1990) -

The Supplemental Remedial Investigation/Feasibility Study was prepared to fill data gaps in the Remedial Investigation for Area B and to answer concerns identified by USEPA. The investigation covered eight study areas (Propellant Shipping Area, Northern and Southern TNT Manufacturing Areas, Tetryl Manufacturing Area, Flashing Ground, Lead Remelt Facility, Rifle Powder Finishing Area, Red Water Ditch, and the Crossover Ditch) within Area B. During the investigation, no significant contamination migration was found to be occurring in the shallow or deep aquifers of the combined (Northern and Southern) TNT Manufacturing Areas. At the Flashing Ground, no contamination was found in the deep aquifer; contamination in the shallow aquifer was confined and was not significantly migrating. No detectable concentrations of nitroaromatic compounds or tetryl were detected in the surface water or sediment collected from the Red Water Ditch, the Crossover Ditch, and the Beaver Pond Drainage System.

Supplemental RI/FS for Area B, Alabama Army Ammunition Plant, Endangerment Assessment Volumes I & II (December 1990) - This document attempted to provide the risk assessment, based on data collected to date, that would define the potential for hazardous substances originating at Area B of ALAAP to cause harm to public health, welfare, and the environment.

RI/FS for the Industrial Sewer System, Alabama Army Ammunition Plant (September, 1991) - The purpose of the investigation and report was to identify the nature and extent of contamination within the industrial sewer system (ISS) in the four former production areas (Northern and Southern TNT Manufacturing Areas, Tetryl Manufacturing Area, and the Acid/Organic Manufacturing Area) and select a remedial response that either successfully decontaminates the ISS or prevents contaminant migration. The results of the Remedial Investigation determined that soils, ditch sediment, and surface water in the vicinity of the sewer lines and manholes at the combined TNT manufacturing area and the tetryl manufacturing area were contaminated to various degrees by nitroaromatic compounds. The Feasibility Study addressed remediation of the industrial sewer lines and manholes in these areas. The remedial action recommended by the Feasibility Study for the ISS was excavation, on-site mobile rotary kiln incineration, and on-site landfilling.

Record of Decision, Alabama Army Ammunition Plant, Stockpile Soils - Operable Unit 2, (December, 1991) - The Record of Decision presented the selected remedial action for the Stockpile Soils Area Operable Unit. The Operable Unit consisted of soils which were removed from Area A during the remedial actions completed in 1988. These soils were located within Building TC4A and a concrete slab covered with an impermeable membrane within Area B of ALAAP. The principal threats posed by the stockpile soils were from

explosives, lead, and asbestos-containing material. The selected remedy consisted of on-site thermal treatment of stockpile soils, on-site disposal of treated soil, and on-site disposal of asbestos-containing material.

Supplemental RI/FS for Area B, Alabama Army Ammunition Plant, Draft Feasibility Study (March, 1992) - This FS was based on the information and data generated during previous field investigations (Exploratory, Confirmatory and RI Survey), and the exposure pathways, potential receptors and corresponding cleanup criteria identified in the Supplemental RI/FS for Area B, Alabama Army Ammunition Plant Draft Endangerment Assessment.

Supplemental RI/FS for Area B, Alabama Army Ammunition Plant, Baseline Risk Assessment, Volume I & II (August, 1992) - This report is a component of the Remedial Investigation/Feasibility Study for Area B of Alabama Army Ammunition Plant. The purpose of the Risk Assessment was to determine the health and environmental risks associated with the no-action alternative. The risk and impact characterization of the areas included in the quantitative Risk Assessment indicates that none of the areas pose unacceptable health risks or impacts, associated with the installation's current caretaker status. However, based on future industrial use of the installation, 12 areas were shown to pose unacceptable human health risks and/or hazards. The future residential use scenario indicated 13 areas that may pose unacceptable human health risks and/or hazards due to the presence of site-related contaminants in one or all of the media sampled (soil, groundwater, surface water, and sediment). The ecological risk evaluation indicated that 14 of the areas may have adverse ecological effects under each of the three scenarios.

Supplemental RI/FS for Area A, Soil Operable Unit, Alabama Army Ammunition Plant, Remedial Investigation Report (December, 1992) - The Supplemental Remedial Investigation/Feasibility Study was prepared at the request of U.S. EPA Region IV to fill data gaps in the Remedial Investigation for Area A and to verify the effectiveness of the remedial actions completed in 1988 at multiple study areas within Area A. The study determined that soils at two study areas within Area A (Study Areas 12 and 30) continued to contain lead and explosives at unacceptable concentrations based on the unrestricted deed that accompanied the transfer of the property to private ownership. The supplemental RI/FS concluded that approximately 2,200 yd³ of lead-contaminated soil from Study Area 12 and approximately 5 yd³ of explosives-contaminated soil from Study Area 30 required further remediation to meet the requirements of the unrestricted deed.

Supplemental RI/FS for Area A, Soil Operable Unit, Alabama Army Ammunition Plant, Feasibility Study (December, 1992) - The Feasibility Study evaluated alternative remedial responses to uncontrolled releases of hazardous substances for all known sites within Area A, using post remedial action data. Only two study areas within Area A (Study Areas 12 and 30) were found to contain contaminants which required Remedial Action based on the supplemental remedial investigation. Areas 12 and 30 contained unacceptable concentrations of lead and explosives. The selected recommended remedial action consisted of solidification of approximately 2,200 yd³ of lead-contaminated soil from Study Area 12 and incineration of approximately 5 yd³ of explosives-contaminated soil from Study Area 30.

Interim Record of Decision, Alabama Army Ammunition Plant, Study Areas 12 and 30 - Area A Operable Unit 2, (April, 1994) - This Interim Record of Decision presented the selected interim remedial action for the soils of Study Areas 12 and 30 within the Area A Soil Operable Unit (OU) at Alabama Army Ammunition Plant (ALAAP), Childersburg, AL. The selected alternative for this action consisted of removal and subsequent incineration of explosive-contaminated soils and solidification of lead-contaminated soils. Approximately 5 cubic yards of 2-4-6 TNT contaminated soil in Study Area 30 were to be excavated to meet the remediation goal of 21 mg/kg and 2,179 cubic yards of lead contaminated soil in Study Area 12 were to be excavated to meet the remediation goal of 500 mg/kg. Contaminated soils from Areas 12 and 30 would be transported to the Mobile Incinerator located within Area B. Contaminated soil would then be thermally treated and solidified prior to on-site landfilling.

Interim Record of Decision, Alabama Army Ammunition Plant, Study Areas 6, 7, 10, 21 and the ISS - Area B Operable Unit 3, (November, 1994) - This Interim Record of Decision presents the selected interim remedial action for the soils from Study Areas 6, 7, 10, 21 and the ISS within the Area B Soil Operable Unit 3 at Alabama Army Ammunition Plant (ALAAP), Childersburg, AL. This interim remedial action consists of excavating, transporting, on-site thermal treatment/solidification and landfilling of 400,000 cubic yard of contaminated soils. The contaminated soil is a direct or indirect result of past explosive production operations of TNT and Teteryl. The thermal treatment would be accomplished using a Mobile Incinerator located in Area B. This interim action began in December 1994.

Final Report for the Remediation of Contaminated Soil from Area A, Study Areas 12 and 30, at the Alabama Army Ammunition Plant (February, 1995) - This report describes the activities associated with the excavation, transport and thermal treatment and stabilization, when necessary, of explosives and lead contaminated soils from Areas 12 and

30 in Area A. These actions were completed in accordance with the Interim Record of Decision for the site.

Closeout Report for the Stockpile Soils Area Operable Unit at the Alabama Army Ammunition Plant - Volumes I and II (February, 1995) - Soil removal activities were completed at Area A during 1986 and 1987. Soils removed during these actions were contaminated with explosives and lead. Removed soil (21,400 cy) was transported to Area B where it was stockpiled. This report documented the thermal treatment of soils and debris contaminated with explosives and the stabilization, where necessary, of the ash.

Supplemental RI/FS for Area A, Alabama Army Ammunition Plant, Final Baseline Risk Assessment (December, 1995) - This risk assessment addressed the findings of the supplemental remedial investigation. Risk calculations were completed using the data generated after the completion of all interim remedial actions. This assessment showed there to be unacceptable human health risks associated with soils at Study Areas 13 and 14.

Supplemental RI/FS for Area A, Alabama Army Ammunition Plant, Final Feasibility Study (February, 1996) - The supplemental FS evaluated alternative remedial responses to uncontrolled releases of hazardous substances for all known sites within Area A. Only two study areas within Area A (Study Areas 13 and 14) contained contaminants which required Remedial Action. Study Areas 13 contained unacceptable concentrations of benzo(a)pyrene, while Study Area 14 contained an unacceptable concentration of lead. The selected recommended remedial action consisted of excavation of approximately 12 cubic yards of contaminated soil from Study Area 13 for transport and off-site disposal and the solidification (in Area B) of approximately 46 yd³ of lead-contaminated soil from Study Area 14.

Alabama Army Ammunition Plant - Area A, Supplemental RI/FS, Draft FS Report (March 1996) - This report addressed metals concentrations which had been detected in the groundwater at Area A. Previous investigations had linked the metals to turbidity within the groundwater samples. Samples collected during this investigation were obtained using low-flow purging techniques to reduce the sediment content in the sample. Analysis of these samples showed no metals concentrations which exceeded the State of Alabama Drinking Water Standards.

Supplemental RI/FS for Area A, Alabama Army Ammunition Plant, Final Remedial Investigation Report (May, 1996) - This document was the Final RI for Area A. In this investigation, a final survey was completed of soils and groundwater within all study areas in Area A to document post remedial action conditions. Groundwater monitor wells were installed within topographic lows to determine if contaminants had been transported by surface runoff prior to infiltration. Significant findings included the presence of Benzo(a)pyrene contamination in the surficial soils at Study Area 13 and elevated levels of lead in a soil sample collected within a tunnel at Study Area 14. These areas were recommended for additional remedial actions. The investigation also showed there to be metals within the soils and groundwater of the site. While the concentrations of these metals were widely variable, it was proposed that they were a result of natural actions and were not the result of plant operations. No other contaminants were found to occur within the soils or groundwater at concentrations which presented human or ecological risk.

Closure Report - Remediation of the Industrial Sewer Lines at the Alabama Army Ammunition Plant (July, 1996) - This document describes the excavation and removal of the Industrial Sewer System (ISS) pipe and manholes, the decontamination of the pipe and manholes, the grouting of core-encased vitrified clay pipe, the verification sampling program, the treatment of water generated during the power washing operations, transportation of excavated materials and backfilling and reseedling of excavated areas. A total of 18,206 linear feet of pipe was deactivated, removed or decontaminated within Study Areas 6, 7 and 10.

Supplemental RI/FS for Area A, Alabama Army Ammunition Plant, Remedial Investigation Report Addendum (August, 1996) - This report addressed metals concentrations which had been detected in the groundwater at Area A. Previous investigations had linked the metals to turbidity within the groundwater samples. Samples collected during this investigation were obtained using low-flow purging techniques to reduce the sediment content in the sample. Analysis of these samples showed no metals concentrations which exceeded the State of Alabama Drinking Water Standards.

Closure Assessment Report (UST), Alabama Army Ammunition Plant (August, 1996) - This report detailed the removal of two underground storage tanks from the former guard shack located at the paper mill entrance to the property. A limited amount of petroleum contaminated soil was removed to an off-site landfill and the tank excavation was backfilled with clean fill. No further action was required at this location.

Interim Record of Decision, Alabama Army Ammunition Plant, Study Areas 2, 10, 16, 17, 19 and 22 within Area B (October, 1996) - This Interim Record of Decision presents the selected interim remedial action for the soils from Study Areas 2, 10, 16, 17, 19 and 22 within Area B at Alabama Army Ammunition Plant (ALAAP), Childersburg, AL. This interim remedial action consists of excavating, transporting, on-site thermal treatment/solidification and landfilling of contaminated soils. The contaminated soil is a direct or indirect result of past explosive production operations of TNT and Tetryl. The thermal treatment would be accomplished using a Mobile Incinerator located in Area B. Soil will be stabilized, when necessary, and landfilled within Area B.

Final Record of Decision for Area A of the Alabama Army Ammunition Plant (January, 1997)-This document presents the selected remedial action for the excavation and disposal of contaminated soils within Study Areas 13 and 14 of Area A. No other medium in any other study area required any additional actions.

Project Closeout Report (Weston TIS 20) for the Alabama Army Ammunition Plant, (July, 1998) - A transportable incineration system (TIS-20) was used as the primary treatment technology for the remediation of explosives contaminated soil. This report presented the information pertaining to site closure associated with remediation activities. Decontamination information for the TIS-20 and the associated site were presented in this report as was a summary of remedial action completed.

Draft Report for the Remediation of Contaminated Soil, Study Areas 13 and 14, Alabama Army Ammunition Plant, Area A (August, 1998) - The remedial actions documented in this report include the removal of Benzo (A) Pyrene (BaP) contaminated soil from Study Area 13 (Small Arms Ballistic Range) and the removal of lead contaminated soil from the two cannon tunnels in Study Area 14. Confirmation samples collected showed that the remedial actions were complete.

Final Report, Study Area 22 Landfill Cap, Area B of the Alabama Army Ammunition Plant (February, 1999) - Study Area 22 within Area B of the installation was an uncontrolled demolition debris dump. Investigations at the area determined that the materials could be capped in place and this decision was presented in the interim ROD completed for Area B (OU4). The cap consisted of a synthetic membrane liner overlain by clay and seeded topsoil layers.

Draft Final Closeout Report - Alabama Army Ammunition Plant Area A (March, 1999) - This Final Close Out Report documented that the U.S. Army had completed all remedial activities for the Alabama Army Ammunition Plant - Area A site (ALAAP - Area A) in

accordance with Procedures for Completion and Deletion of National Priorities List Sites and Update (OSWER Directive 9320.2-3C). This report covered only ALAAP - Area A which includes Operable Unit 1 and Operable Unit 2.

Final Report, Cleanup of Coal Tar at the Aniline Sludge Basin (Study Area 9) within Area B of the Alabama Army Ammunition Plant (October, 1999) - The Aniline Sludge Basin (Study Area 9) received liquid wastes and sludge from the production of aniline during plant production. The basin also received ash and coal tar from the northern power plant. Investigations completed at the site concluded that the tar-like material should be removed from the basin. This action was completed as a removal action and was not included in any interim ROD at the site. Approximately 3,063 cubic yards of material were excavated and transported to an off-site RCRA Subtitle D landfill (Cedar Hills Landfill) in Ragland Alabama. A valve pit was collapsed in place and backfilled and lead ingots from other remedial action at the site were also disposed of off-site. Basin berm walls and clean fill were used to backfill the excavations and the area was seeded for erosion control.

Final Summary Report for the Remediation of TNT and Lead Contaminated Soil and Sewers, Operable Unit 3, Area B of the Alabama Army Ammunition Plant (May, 2000) - This document serves as the closeout report for Area B - OU3 and summarizes all remedial action reports prepared in association with the Area B - OU3 remedial actions. Included in this report are all remedial action confirmation sample data showing that the actions completed are final.

Environmental Baseline Survey for Area B of the Alabama Army Ammunition Plant (June, 2000) - This report presented the results of the Environmental Baseline Survey (EBS) conducted by SAIC in accordance with BRAC requirements for the release of the property. This report reviewed all actions completed to date on the property and classified areas within the facility as to the amount of environmental response necessary before the property can be released.

Remedial Investigation/Feasibility Study - Alabama Army Ammunition Plant Area B - Final Supplemental RI Report (August 2001) - This Supplemental RI was conducted to fill data gaps from previous investigations and further define the presence, nature, and extent of environmental contamination in groundwater, soils, and sediments resulting from the production of explosives at ALAAP.

Supplemental RI activities were conducted at 25 study areas, including 19 study areas identified during previous investigations and 6 additional sites identified during the

Community Environmental Response Facilitation Act (CERFA) investigation (TETC 1994). Baseline risk assessments were conducted for human health and ecological effects. The purpose of the risk assessments was to help determine whether any of the study areas or CERFA sites should be evaluated in a companion document, the Feasibility Study (FS) Report. The FS Report evaluates remedial action alternatives for study areas where remedial actions may be required.

This investigation consisted of field screening soil and sediment; sampling and analyzing surface soil, sediment, and surface water; drilling and sampling 64 soil borings; sampling 50 existing monitoring wells at Area B; and installing and sampling 40 additional monitoring wells. Hydrogeologic investigations included groundwater and surface water elevation measurements and slug testing. In addition, bioassays were conducted and biota samples of crayfish, fish, and rabbit tissue were collected and used to evaluate the potential environmental impacts of contamination at Area B of ALAAP. Aerial and topographic surveying was completed to map Area B surface features.

Results from this Supplemental RI indicated that all environmental media, including groundwater, surface water, soil, and sediment, have been impacted to various degrees by previous activities at ALAAP. The contamination is characterized primarily by nitroaromatic compounds and metals associated with the production of explosives and the manufacturing of supporting chemicals. Groundwater quality underlying Area B is the primary environmental concern and contaminants consist of elevated concentrations of lead and elevated nitroaromatic concentrations, including 2,4-DNT, 2,6-DNT, and 2,4,6-TNT. Contamination occurs in the southern portion of Area B between Study Area 17 (Propellant Shipping Area) and Study Area 18 (Blending Tower Area) and extends north toward Study Area 6 (Southern TNT Manufacturing Area). Additional nitroaromatic compounds detected in Area B groundwater include 1,3,5-trinitrobenzene (TNB), 1,3-dinitrobenzene (DNB), nitrobenzene, isomers of nitrotoluene, and the nitroaromatic breakdown products 2-amino-4,6-DNT, and 4-amino-2,6-DNT. The spatial distribution of lead, detected in Area B groundwater at concentrations exceeding the EPA action level (15 $\mu\text{g/L}$), was similar to the observed patterns for the nitroaromatic compounds suggesting a common source area. Concentrations of nitroaromatic compounds and lead also were detected in bedrock wells.

This report is the final report for soils within Area B. Groundwater investigations are continuing with an anticipated completion date of August, 2003. Data presented in this SMP is the most current available for all impacted media and has been summarized in the discussions of each Study Area within Area B (Section 5) of this Site Management Plan.

4.0 Area A Site Descriptions

This section summarizes the principal findings from previous investigations within Area A (exploratory, confirmatory, RI and supplemental RI/FS reports), summarizes the known history and presents the current status of each area of concern. **Study Area Map A** shows the locations of all Study Areas in Area A. These areas are described below.

4.1 Study Area 11 - Magazine Area

The Magazine Area, located in the north central portion of Area A, consists of a series of concrete storage buildings covered with earth. This Area is the largest study area in ALAAP Area A. The Series 260 Buildings are designated for storing DNT, the Series 1010 Buildings for storing tetryl, and the Series 811 Buildings for storing TNT.

Soils were sampled at two different times as part of the RI effort and analyzed for explosives and inorganic chemicals. Of the soil samples collected during the confirmation investigation one sample indicated the presence of 1,3-dinitrobenzene (1,3-DNB). No other explosive or organic chemicals were detected at this study area. Contaminated soils were removed from the vicinity of the storage buildings during the initial removal actions completed in 1988. The amount of munitions reaching groundwater from this area is expected to be low because of the low concentrations detected in the soils. Groundwater monitor wells were installed to determine the potential impact of contaminants on the groundwater. No compounds of concern were detected in the groundwater within the study area.

Due to the proximity of a hardwood swamp near Study Area 11, the potential existed for chemicals in the soil to migrate to the swamp via surface runoff during periods of heavy rainfall. No contaminants were detected in the surface water or the sediments of the swamp. Parts of this area are currently logged and cleared for hunting.

No risk has been identified in association to the soils in this study area and this area was recommended for no further action in the final ROD for the site.

4.2 Study Area 12 - Old Burning Ground

This study area is located in the northern section of Area A and was the disposal site for unacceptable batches of explosives, propellants, and other reactive wastes. Demolition debris was burned in this area during the demolition of the plant and the study area also included a former Lead Remelt Facility.

Nitroaromatic compounds and metals were detected at this study area. The primary migration pathways of munitions and metals detected in soil were fugitive dust or particulate.

emission. In addition, the potential existed for chemicals in soil to migrate via surface runoff during periods of heavy rainfall. The amount of munitions reaching groundwater from this area were expected to be low because of the low concentrations originally detected in the soils and the completed remedial actions to remove the potential sources.

This area was the subject of extensive soil removal during the initial removal actions completed in 1988. An additional interim remedial action for contaminated soil within study Area 12 was completed in November 1994. An Interim Record of Decision was approved that selected removal and subsequent incineration of explosive-contaminated soils and solidification of lead-contaminated soils. A total of 2,179 cubic yards of lead contaminated soil in Study Area 12 was excavated to meet the remediation of 500 mg/kg.

No additional contaminants of concern have been identified in the soil or the groundwater and this area was recommended for no further action in the final ROD.

4.3 Study Area 13 - Small Arms Ballistics Range

This study area is approximately 3.7 acres, located centrally at the northern boundary of Area A. This area was covered by gravel during the operational period and was used as a training range for small arms ballistics. A ballistics laboratory was adjacent to this area during the operational period. Lead contaminated soils and all buildings were removed from the site during the initial removal actions completed in 1988.

Organic chemicals and metals were detected at this study area during a subsequent investigation. The primary migration pathways of organic contaminants and metals detected in the soil were fugitive dust or particulate emission. In addition, the potential existed for contaminants in the soil to migrate via surface runoff during periods of heavy rainfall. No contaminants of concern are currently detected in the groundwater at this site.

The Risk Assessment completed for the study area determined that the concentration of Benzo (A) pyrene (BaP) in soils posed a potential hazard to humans. As such, this site was recommended for additional remedial actions in the Record of Decision for the site. Removal of approximately 12 cubic yards of BAP contaminated soil was been completed and confirmation samples showed no remaining contamination. A final Remedial Action Report was issued and the site was recommended for no further action.

4.4 Study Area 14 - Cannon Range

This study area, used for cannon test firing, is approximately 13 acres located at the northeast corner of the northern boundary of Area A. Since operations ceased at ALAAP all buildings have been removed and the remaining area has not been maintained.

Only lead was detected at this study area. One soil sample collected from the end of a tunnel used for the firing of inert projectiles showed a lead concentration of approximately 14,000 ppm. This area was the subject of an additional remedial action during which the lead contaminated soil was removed to Area B, where it was stabilized on-site. A final Remedial Action Report was issued and the site was recommended for no further action.

4.5 Study Area 15 - Old Well

The Old Well was a relict hand-dug well, located in the northeast portion of Area A, which served a farm or residence prior to construction of ALAAP. The well was reported to be approximately 30 ft deep and 5 ft in diameter. During the razing of the laboratory building which supported the explosives manufacturing operations, laboratory reagents, non-sparking paints, 55-gallon (gal) drums of a tar-like material, fire retardant paint, containers of other unidentifiable materials, and old tires were reportedly disposed of in this well.

This well was removed during the initial removal actions completed in 1988 and no additional soil contamination was detected. No contaminants presenting health risks have been identified in the groundwater at the site and the site was recommended for no further action in the final ROD.

4.6 Study Area 17 - Propellant Shipping Area

The propellant shipping houses were located in the south-central portion of Area A and overlaps into Area B. The shipping house area (Series 229 Buildings) used to store propellant prior to shipment and consisted of 48 buildings, 13 of which are located on the land previously sold to U.S. Alliance. The remaining 35 buildings were located within the current ALAAP boundary and comprised Study Area 17 which is split between Area A and Area B.

Soil samples from this study area were collected during initial RI efforts as well as after the 1988 cleanup was complete. No organic contaminants were detected in the first sampling effort. All soil samples collected as part of the supplemental RI contained detectable levels of lead. The levels of lead appeared to be similar to the concentrations across Area A, indicating that lead is not associated with a source. The primary release mechanism for lead at this site would be via release to the atmosphere as particulate or dust emissions. However, due to the low concentrations, the degree of vegetative cover and relatively few areas of bare soils, this migration pathway was not considered significant. The shipping houses were removed during an initial removal action completed in 1988. No contaminants presenting a health hazard were identified in the groundwater and the area was recommended for no further action in the final ROD.

4.7 Study Area 30 - New Trench Area

During initial removal activities conducted by Roy F. Weston, Inc. (Weston) in 1988, Study Area 30 was identified. This area was approximately 2.9 acres located north of Study Area 11. Area 30 was used for disposing of equipment and other general wastes during the demolition of the plant.

Nitroaromatic compounds (2,4,6-TNT) were detected in 3 of the 34 soil samples collected during the Supplemental investigation with one sample containing a high concentration (13,900 ppm) of this compound. Two soil samples also contained 1,3,5-TNB. The presence of these contaminants was due to past disposal operations in the area.

Additional interim remedial action for contaminated soil within study Area 30 were completed in November 1994 based on the results of the supplemental RI. The selected alternative for this action consisted of removal and subsequent incineration of explosive-contaminated soils. Five cubic yards of 2,4,6 TNT contaminated soil were remediated to meet the remediation level of 21 mg/kg. Contaminated soils from Area 30 were transported to the on-site mobile Incinerator which was located in Area B, thermally treated and placed in an on-site landfill.

No additional contamination was detected in the soil or the groundwater at this site and the area was recommended for no further action in the final ROD.

4.8 Study Area 31 - Disposal Area

During initial removal activities completed by Weston in 1988, Study Area 31 was identified. This area was less than 1 acre and is located north of Study Area 11 and east of Study Areas 30 and 12. Study Area 31 was used for disposing of equipment and other general wastes during the demolition of the plant.

No nitroaromatic contamination was detected in any of the soil samples collected as part of the supplemental investigation. Metals were present at levels that were believed to be background concentrations at the site. No contaminants presenting a health hazard were identified in the groundwater. This area was recommended for no further action in the final ROD.

4.9 Study Area 29 - Rubble Pile and Study Area 32 - Number 2 Rubble Pile

During initial removal activities conducted by Weston in 1988, Study Areas 29 and 32 were identified. These tracts were suspected to have been localized areas used for the disposal of equipment and other general wastes during the demolition of the plant. Study Area 29 is located near the Area A northwest boundary, and Study Area 32 is directly across the road. Debris was removed during the removal action and subsequent investigation indicated that

the confirmatory analytical results for these two areas were below detection limits. Soil and groundwater samples collected have shown no contaminants are present which may present a human or ecological hazard and this site was recommended for no further action in the final ROD.

4.10 Study Area 33 - Henningburg Area

During initial removal actions completed by Weston in 1988, Study Area 33 was identified. This area is located centrally near the Area A/B boundary. This area was suspected of being a localized area used for the disposal of equipment and other general wastes during the demolition of the plant. Contaminated soil was removed shortly after discovery. Additional sampling indicated that no contamination was remaining at the area in the soil or groundwater. This area was recommended for no further action in the final ROD.

4.11 Study Area 34 - 229 Area

During initial removal activities completed by Weston in 1988, Study Area 34 was identified. This area was used for disposing of equipment and other general wastes during the demolition of the plant and is located directly south of Study Area 17.

Only lead was detected at this study area and the levels of lead appear to be similar to the concentrations across Area A, indicating that lead is not associated with a source. Soil and groundwater samples collected have shown no contaminants are present which may present a human or ecological hazard and the area was recommended for no further action in the final ROD.

5.0 Area B Site Descriptions

Area B comprises the western portion of ALAAP, which contained most of the industrial facilities at ALAAP. This section summarizes the principal findings from the initial investigations within Area B (exploratory, confirmatory, RI and supplemental RI/FS reports) and presents current data from the Final Supplemental RI report. This section summarizes the known history and presents the finding and interim remedial actions for each area of concern. The supplemental groundwater investigation looked at the groundwater within Area B as a single area of investigation. As such, groundwater information for the investigation is not addressed on a Study Area basis but is summarized as a whole unit. Surface water and sediment not associated with a particular study area (Coosa River, Talladega Creek) is summarized at the end of this section as well. **Study Area Map B** shows the location of all Study Areas in Area B. These areas are described below.

5.1 Study Area 2 - Smokeless Powder Facility

Most of the smokeless powder facility is located in the leaseback area which was sold to Kimberly Clark. This property is now owned by the U.S. Alliance Paper Company. The Installation Assessment indicated that smokeless powder pellets often spilled during the loading of packages of explosive pellets into fiber boxes for shipping.

The initial Environmental Survey identified the following: levels of zinc and mercury just above background levels in groundwater; 2,4-DNT in sediment samples; and dinitrotoluene residues in soil samples. Asbestos contamination was found to be minimal.

The Confirmatory Survey of the area concluded that no further investigation of the study area was necessary because the extent of any contamination was sufficiently defined so that decontamination and salvage could be successfully accomplished and release action taken. The Remedial Investigation reported that the buildings were decontaminated and burned, the equipment decontaminated and salvaged, and the area has been transferred back to Kimberly Clark, now U.S. Alliance Paper Company. A portion of Study Area 2 that still remains in Area B and is being addressed during the supplemental RI.

During the Final Supplemental RI, surface soil samples and splitspoon samples from soil borings were collected and screened onsite for explosives. The subsurface soil samples above were also analyzed at a laboratory for metals, explosives, VOCs and SVOCs. The Final Supplemental RI determined:

- ▶ Soil screening data collected indicated that extensive explosives contamination is not present in the surface soils. Contamination was limited to an area of 500 feet square and to a depth of 1 foot below land surface

(BLS). Laboratory analysis confirmed the presence of 2,4-DNT (2,4-DNT) contaminated soil at one location. The area of contaminated soil was remediated under an Interim ROD (OU4).

- ▶ Under the likely future land use scenario (i.e., industrial and construction), human health COCs include arsenic and six polycyclic aromatic hydrocarbons (PAHs) (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene).
- ▶ Nineteen metals were detected at concentrations that exceeded background; eight metals (aluminum, arsenic, barium, chromium, lead, manganese, vanadium, and zinc) were identified as ecoCOCs (HQ >1). EcoCOCs with HQs >10 included aluminum, chromium, lead, and vanadium. Aluminum was detected in Study Area 2 at high concentrations and was the primary metal contributor to ecological risk.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include 2,4-dinitrotoluene, four metals (arsenic, hexavalent chromium, iron and manganese), and six PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene).
- ▶ Based on industrial and construction land use, it was recommended that the areas of PAHs and elevated arsenic concentrations in the surface soils be evaluated in the FS.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for 2,4-DNT, PAHs and the elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of the environment, it was also recommended that the FS evaluate actions required for elevated metals concentrations in the surface soils.

5.2 Study Area 3 - Sanitary Landfill

The sanitary landfill was located in the west-central portion of the industrial area. According to the Environmental Survey, most of the fill material was domestic solid waste and building rubble. The only industrial, chemical, or reactive wastes disposed of in this landfill were

limited quantities of material contaminated with explosives. The landfill was operational from the beginning of World War II operations until at least the late 1970's.

During the initial Environmental Survey soil samples were collected and analyzed. Two samples were contaminated with lead. Of the four samples analyzed for mercury, two had low levels. Only one soil sample had detectable concentrations of TNT, nitrobenzene, and 1,3,5-trinitrobenzene. Three samples contained nitroaromatic residues. Asbestos materials were also evident in these samples. One groundwater monitoring well was installed in this area during the initial environmental survey. The analysis of samples showed no detectable concentrations of contaminants of concern. The area was visually inspected for asbestos; both friable and Transite asbestos materials were found to be mixed in the landfill soil. Asbestos contamination is estimated to cover 13,000 square yards and to occupy a volume of 21,500 cubic yards within the landfill. Based on the findings of the initial environmental survey, the confirmatory survey concluded that the extent of contamination and its migration potential had been adequately defined for the Sanitary Landfill.

During the 1986 RI, a groundwater sample was collected and analyzed for nitroaromatics and lead. No nitroaromatics or lead were detected in the sample. Five soil samples were also collected and analyzed. One sample contained a low level of extractable lead utilizing the TCLP procedure.

During the Final Supplemental RI, surface soil samples and splitspoon samples from soil borings were collected and screened onsite for explosives. The splitspoon samples were also analyzed at a laboratory for metals, explosives, VOCs, SVOCs and PCBs/pesticides. Some samples were analyzed for hexavalent chromium. The Final Supplemental RI determined:

- ▶ Eighteen metals were detected in soils at concentrations that exceed background, but none was identified at a human health COC under the industrial or construction land use scenarios.
- ▶ Under the most conservative land use scenario (i.e, residential), human health COCs include arsenic, iron and manganese.
- ▶ Four metals were identified in soils as ecoCOCs (HQ >1) (arsenic, cobalt, lead, and vanadium). Vanadium was identified as an ecoCOC with an HQ >10.
- ▶ No explosives, VOCs, SVOCs, or pesticides/polychlorinated biphenyls (PCBs) were identified as soil COCs at this study area.

- ▶ No further action at the Study Area was recommended based on the likely future industrial and construction land uses.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources, it was recommended that the FS evaluate actions required for vanadium in the surface soil.

5.3 Study Area 4 - Manhattan Project Area

Located in the western portion of the General Services Administration Area, the Manhattan Project used a small part of the ALAAP from 1943 to 1945. According to a letter from a staff member at Formerly Utilized Sites Remedial Action Program to the Department of the Army, dated October 1989, an investigative records search was completed in October 1985 to determine the potential for radioactive contamination at the site. The letter states that the installation was designed to produce 1,600 pounds of heavy water per month, but records indicate that it produced under 600 pounds per month with a total production of 11,160 pounds from January 1944 through July 1945. Storage tanks were formerly located at the site. In 1945/46 all buildings were removed except for one small brick building which was later destroyed. No records were found to describe site closeout activities. No information was available concerning any chemical use at this site.

During the Environmental Survey one groundwater monitoring well was installed near the middle of the study area. Groundwater sampling did not reveal nitroaromatic compounds. In two soil samples, a significant concentration of lead was found. A visual inspection and walkover of the area revealed only Transite asbestos materials, which were widely scattered over a surface area of approximately 3,400 square yards.

Surface soil samples and subsurface soil samples from soil borings were collected during the Final Supplemental RI and analyzed for lead. In addition, two surface soil and seven subsurface soil samples were collected and analyzed for metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ Thirteen metals were detected in soils at concentrations that exceed background. For human health, lead was identified as a COC under the future construction land use scenario and under the most conservative (i.e., residential) land use scenario.

- ▶ Three metals (aluminum, lead, and zinc) were identified in soils as ecoCOCs (HQ >1). Aluminum and lead were ecoCOCs with HQ >10 and were present in the soils at concentrations that exceeded the ecoRGOs.
- ▶ Aluminum is the primary contributor to ecological risks (HQ >100).
- ▶ No explosives, volatile organic compounds (VOCs), or semivolatile organic compounds (SVOCs) were identified as soil COCs.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), it was recommended that the FS evaluate elevated lead concentrations in the surface soils.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated lead concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions required for elevated concentrations of lead and aluminum in the surface soils.

5.4 Study Area 5 - Red Water Storage Basin

The Red Water Storage Basin was constructed on the northern side of the Red Water Ditch, several hundred yards to the west of the southern TNT manufacturing area and was intended to be used as a settling basin for TNT manufacturing process wastewaters. The basin covered an area of 395,000 square feet and was surrounded by a 6-foot clay berm. An entry pipe was located at the southeast corner and an exit flume to the Red Water Ditch was located in the southwest corner. The basin contains some water during even the driest periods of the year.

During the Environmental Survey three groundwater monitoring wells were installed. Of the three groundwater samples collected, one sample contained trace levels of nitroaromatics. Surface water samples showed no concentrations of any contaminants. Of the seven sediment samples analyzed, only those in the immediate area of the waste inlet were contaminated with TNT and sulfate.

An additional groundwater monitoring well was installed during the Confirmatory Survey and groundwater samples were collected from the new well and the previously installed well

which had showed trace levels of nitroaromatics. No contaminants were detected in either of the wells during this event.

During the Final Supplemental RI, sediment samples were collected from the basin along transects and screened in the field for explosives. Two of the samples, one at either end of the basin, were sent to the laboratory for confirmation analysis that included metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ No metals were detected at concentrations that exceeded background in the sediments at Study Area 5. One non-target explosive compound (cyclotetramethylenetetranitramine [HMX]) was detected in one sediment sample. There is no documented history of HMX production or use at ALAAP.
- ▶ No human health or ecoCOCs were identified.
- ▶ Based on the results of the Final RI, it was determined that no further actions are required for sediments at the Red Water Storage Basin.

5.5 Study Area 6 - Southern TNT Manufacturing Area

Study Area 6 was a DNT and TNT manufacturing area. Ditches were present where wooden flumes formerly carried wastes to the industrial sewers. The production lines in this area were extensively bulldozed during demolition and all that remained as evidence of the former structures were the roadways and portions of building foundations. Contaminated soil initially situated adjacent to certain buildings was assumed to have been dispersed throughout the area in a random pattern.

Environmental Survey sampling activities included the installation of two groundwater monitoring wells. One of the wells was found to contain a significantly high level of nitrite and nitrate, indicative of contamination of this aquifer by wastes from nitric acid production and nitration operations. This same well contained concentrations of nitrobenzene, 2,4-DNT, 2,6-DNT, 1,3-DNB, 2,4,6-TNT, 1,3,5-TNB, 2,4-dinitrophenol, and 2-methy-4,6-dinitrophenol. Nitroaromatic residues were detected in 11 of the 12 soil samples collected. Five of the eight samples from the production line contained TNT; 2,4-DNT and 1,3,5-TNB were each detected at separate sampling locations. Soil samples collected from the spoil dredged from the Red Water Ditch were highly contaminated with TNT. 2,4-DNT and 2,6-DNT were also detected. A walk-through survey was made to observe the extent of soil contamination by asbestos. Most of the Transite-containing rubble from building demolition was located around or near the building foundations. All open areas had been thoroughly bulldozed, scattering Transite materials throughout an estimated 80,000 square yards.

Friable asbestos was difficult to locate due to the extent of destruction; however, it was found in large pieces along the pipelines in areas where bulldozing would be difficult.

Three additional groundwater monitoring wells and one piezometer cluster were installed as part of the Confirmatory Survey. Sampling results from the three new wells and the two previously installed wells showed concentrations of 2,4,6-TNT, 2,4-DNT, 2,6-DNT, nitrobenzene, 1,3-dinitrobenzene, and 1,3,5-trinitrobenzene. Following this sampling, a total of 18 wells and 2 piezometer clusters were installed around the perimeter of the southern and northern TNT manufacturing areas to better define the groundwater hydrology and extent of contamination in this area. Three soil cores were collected, and results found 2,4,6-TNT, 2,4-DNT, and 2,6-DNT present in varying concentrations.

During the Remedial Investigation five soil samples were collected and analyzed for extractable lead (TCLP). The results were below the detection limit for all five samples. Four groundwater samples were collected from the existing wells and analyzed for six nitroaromatic compounds.

During the Supplemental Remedial Investigation, field sampling activities for the northern and southern TNT manufacturing areas were combined. The Supplemental Remedial Investigation activities included installation of seven groundwater monitoring wells. Groundwater samples were collected from the seven new wells and from three previously installed wells. Nitroaromatic contaminants were detected in 3 of the 10 wells sampled.

Contaminated soils were removed from the Study Area in 1994 under an IROD (OU3). Explosives contaminated soils were thermally treated and the ash was landfilled. Lead contaminated soils and ash were stabilized and landfilled. Asbestos was removed to a secure repository. The Industrial Sewer System in Study Area 6 was excavated and decontaminated in 1997.

As a follow-up to the remediation activities conducted by Roy F. Weston under the 1994 IROD, soil borings were placed adjacent to excavated areas during the Final Supplemental RI. Samples were screened from each of the borings to a depth of 30 feet. Two samples were sent to the laboratory for analysis of metals, explosives, VOCs, and SVOCs. The results of the Final Supplemental RI included:

- ▶ Ten metals were detected in the soils at concentrations that exceed background.
- ▶ No human health COCs were identified in soils.

- ▶ Lead was identified as an ecoCoC (HQ >1) in surface soil. Lead was not identified as an ecoCoC with an HQ >10.
- ▶ This soils in this study area have been remediated. No further action for soils is required based on future and use scenarios.

5.6 Study Area 7 - Northern TNT Manufacturing Area

Industrial activities in this area produced 2,4,6-TNT and 2,4-DNT. The area consisted of four 2,4,6-TNT production lines and one DNT production line. Red water from this area was discharged into the open Red Water Ditch. Ditches indicate the locations where wooden flumes formerly carried wastes to the industrial sewers. Like the Southern TNT Manufacturing Area, this production area has been completely razed. Material was spread over a wide area during the demolition; only foundations and portions of the sewer system remain.

Environmental Survey activities included collection and analysis of 10 soil samples. The results showed that all of the samples contained nitroaromatic compounds. 2,4-DNT was detected in the surface soils of the DNT production area. Sampling results from one of two *groundwater monitoring wells* showed a significantly high level of TNT and DNT, and detectable concentrations of 2,4-DNT, 2,6-DNT, and 2,4,6-TNT. A walk-through survey was conducted to observe the extent of soil contamination by asbestos. Most of the Transite-containing rubble from building demolition was located around or near the building foundations. All open areas had been thoroughly bulldozed, scattering Transite materials throughout these areas (an estimated 70,000 square yards). Friable asbestos was difficult to locate due to the extent of destruction; however, it was found in large pieces along the pipelines in areas where bulldozing would be difficult.

Two groundwater monitoring wells were installed as part of the Confirmatory Survey and 2,4,6-TNT and 2,6-DNT were detected in the groundwater samples. Five soil cores were collected and analyzed. Various levels of 2,4,6-TNT, 2,4-DNT, and 2,6-DNT were present in the cores.

The Remedial Investigation activities included collection and analysis of soil samples to determine the level of extractable lead. Of the five samples, levels in one sample were below the detection limit while the remaining five had concentrations below the established extraction procedure toxicity criterion. Three groundwater samples were collected from the existing wells and analyzed; all contained detectable concentrations of all six nitroaromatic compounds.

Contaminated soils were removed from the Study Area in 1994 under an IROD (OU3). Explosives contaminated soils were thermally treated and the ash was landfilled. Lead contaminated soils and ash were stabilized and landfilled. The Industrial Sewer System in Study Area 7 was excavated and decontaminated in 1997. Asbestos was removed to a secure disposal facility.

During the Final Supplemental RI, soil borings were placed adjacent to remediated areas in this study area and soil samples were screened for explosives. Subsurface samples from the borings were sent to the laboratory for confirmation analysis of metals, explosives, VOCs, and SVOCs. The results of the Final Supplemental RI included:

- ▶ Thirteen metals were detected in soils at concentrations that exceed background.
- ▶ No human health COCs were identified under the likely future land uses (i.e., industrial or construction land use).
- ▶ Under the most conservative land use (i.e., residential), human health COCs include 2,4,6-TNT and manganese.
- ▶ Lead was identified as an ecoCOC (HQ >1) in surface soil. Lead was not identified as an ecoCOC with an HQ >10.
- ▶ This soils in this study area have been remediated. No further action for soils is required based on industrial or construction land use. Since no ecoCOCs were identified with HQs >10 at this study area, no further actions are required for protection of ecological receptors.

5.7 Study Area 8 - Acid/Organics Manufacturing Area

In the acid/organic manufacturing area, nitrobenzene was made and reduced to form aniline, N,N-dimethylaniline, and diphenylamine. Concentrated nitric acid, oleum (fuming sulfuric acid), and sodium sulfite (sellite) were also produced. Included in this area was a former sulphur burning pit.

The Environmental Survey activities included the collection and analysis of six soil samples. Nitrobenzene was detected in soils at Building 904-A and a high concentration of lead was present in one soil sample collected. Two groundwater monitoring wells were installed and one of them was found to contain high levels of nitrite and nitrate. High nitrite and nitrate levels in soil are indicative of contamination of this aquifer by wastes from nitric acid production and nitration operations. No detectable nitroaromatic residues or organic bases

were detected. A walk-through survey was conducted to observe the extent of soil contamination by asbestos. Extensive bulldozing resulted in the mixing of both Transite and friable asbestos with the soils, covering an estimated 200,000 square yards. Particles of sulfur up to 1 inch in diameter were abundant on the soil surface in the sulfur storage area. The area contaminated by sulfur and acid wastes covers approximately 27,000 square yards.

Five soil samples were collected during the Remedial Investigation to delineate the high lead hits found during the Exploratory Survey. No detectable concentrations of extractable lead were found in any of the samples.

As part of the Supplemental Remedial Investigation, one down gradient monitoring well was sampled. Neither nitroaromatic compounds nor tetraol were detected in this sample.

To better delineate the magnitude and extent of contamination, surface soil samples and subsurface soil samples from soil borings were collected during the Final Supplemental RI. Test pits were also completed to sample soils from depths expected to be encountered during future construction activities. Surface and subsurface soil samples were screened for explosives. All soil samples submitted for confirmation analysis were analyzed for metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ Nineteen metals were detected in surface soils at concentrations that exceed background. One metal (nickel) was identified as a human health COC under the future construction land use.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include five metals (arsenic, iron, lead, manganese and nickel), and five PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene).
- ▶ Nine metals (aluminum, arsenic, barium, lead, manganese, molybdenum, nickel, vanadium, and zinc) were identified in soils as ecoCOCs (HQ >1). Four metals (aluminum, lead, nickel and vanadium) were identified as ecoCOCs with HQs >10. The primary contributors to the ecological risk are aluminum, lead and nickel. Aluminum had an HQ >100 and was detected in the western region of the former manufacturing area and the non-manufacturing portion of Study Area 8.
- ▶ Vanadium was detected in the soil in the non-manufacturing portion of Study Area 8, near the Aniline Sludge Basin.

- ▶ No explosives, VOCs, or SVOCs were identified as soil COCs.
- ▶ Eleven metals were detected at concentrations that exceeded background in the subsurface soil samples collected from the test pits. Iron was identified in the subsurface soil as a human health COC for the construction worker exposure scenario.
- ▶ Under the most conservative land use (i.e., residential), the human health COCs in the subsurface soil include three metals (antimony, arsenic and iron).
- ▶ For the future likely land use scenarios (i.e., industrial and construction), it was recommended that the FS evaluate elevated nickel concentrations in the surface soils and elevated iron concentrations in the subsurface soils.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated metals concentrations in the surface and subsurface soils and PAH concentrations in the surface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions required for elevated concentrations of metals in the surface soils. No further actions are required for subsurface soil for protection of ecological resources.

5.8 Study Area 9 - Aniline Sludge Basin

The sludge basin, with an area of approximately 20,000 square feet, was unlined and constructed of clay dikes and a clay bottom. Liquid wastes and sludge from the production of aniline in the acid/organic manufacturing area were deposited in the basin. Ash from the northern power plant may also have been disposed of in the basin. There was an industrial inlet on the western side of the basin and a sewer line existed to discharge water from the pond to the Coosa River during periods of high water levels. Although the pond contained water year-round, it became shallow during the dry season. The bottom of the basin was covered with a very fine, black silt that varied from 2 to 4 inches in depth. An area approximately 500 feet by 50 feet in the southern end of the basin was underlain by fractured bituminous like material. This material was removed from the basin and disposed of off-site in 1999.

The Environmental Survey activities included installation of four groundwater monitoring wells. Sampling results from one of the wells showed a significantly high level of TNT and DNT. The second well contained 2,4-DNT just above the minimum detectable concentration. Concentrations of TNT, 1,3-dinitrobenzene, and 1,3,5-trinitrobenzene were found at one sediment sampling location where a waste-water line from the acids area entered the basin. Two sediment samples revealed the presence of cadmium, nickel, chromium, copper, and zinc. Surface water sampling revealed no concentrations of contaminants.

One groundwater monitoring well was installed as part of the Confirmatory Survey. Groundwater samples were collected and analyzed from this well and the previously installed well, where concentrations of nitroaromatics were found. No detectable nitroaromatic residues were found in either sample.

One groundwater sample was scheduled to be collected from a monitoring well during the Remedial Investigation. Due to low water table conditions, this was not possible. No further work was done at this site as part of the initial Remedial Investigation.

During the Final Supplemental RI, sediment samples were collected from a grid and screened in the field for explosives. In addition, at two of the locations, sediment samples were collected with a hand auger to a depth of 5 feet. Two samples were collected from the basin and laboratory analyzed for metals, explosives, VOCs, and SVOCs. The results of the Final Supplemental RI included:

- ▶ Eleven metals were detected in sediments at concentrations that exceed background. Sediment exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land use.
- ▶ The highest concentrations of metals were detected at the northern end of the basin, suggesting that the source was the inlet to the basin. The presence of metals in the sediments at the Aniline Sludge Basin is consistent with its use as a holding pond for sludge from the Acid/Organic Manufacturing Area.
- ▶ Sediment exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land use.

- ▶ Under the most conservative land use (i.e., residential), iron was identified as a human health COC.
- ▶ Seven metals were identified as ecoCOCs (HQ >1), including arsenic, chromium, copper, lead, manganese, nickel, and zinc. Arsenic and copper were ecoCOCs with HQs >10. Four PAHs were identified as ecoCoCs (HQ >1).
- ▶ No explosives or VOCs were identified as COCs in the human health or ecological risk assessments, but a four PAHs were COCs (HQ >1) for ecological receptors. These PAHs were not ecoCOCs with HQs >10.
- ▶ An elevated concentration of explosives (1,800 µg/g) was detected in one screening sample collected at a depth of 1 foot BLS at the outlet to the basin. Explosives were not detected in any other screening samples collected from the basin. TNT and 4-amino-2,6-DNT (4-A-2,6-DNT) were detected at concentrations less than 5 µg/g in the confirmatory samples from the basin sediments.
- ▶ Ten metals were detected in the tar at concentrations that exceeded background. Three SVOCs were detected in the tar collected from the Aniline Sludge Basin (carbazole, N-Nitrosodiphenylamine, and phenol).
- ▶ No human health COCs were identified because exposures were not evaluated for the likely future land uses (industrial and construction) as this material was to be removed.
- ▶ Under the most conservative land use (i.e., residential), iron, lead and N-nitrosodiphenylamine were identified as human health COCs.
- ▶ No ecoCOCs were identified as this material was to be removed.
- ▶ Eight metals were detected at concentrations that exceeded background in the sediments collected from beneath the tar at the Aniline Sludge Basin.
- ▶ Four SVOCs were detected in the sediments that were sampled from beneath the tar. Three of the SVOCs (carbazole, N-Nitrosodiphenylamine, and phenol) were detected in both the tar and the sediments beneath the tar. Benzoic acid also was detected in the sediments beneath the tar.

- ▶ Exposure to subsurface sediments was not evaluated in the ecological risk assessment. Therefore, no ecoCOCs were identified.
- ▶ No human health COCs were identified for the sediment beneath the tar.
- ▶ One surface water sample was collected at Study Area 9. Five metals were detected at concentrations that exceeded background in the surface water. Explosives and SVOCs were not detected in the surface water sample.
- ▶ Surface water exposures were not evaluated under industrial and construction future land uses as the basin was scheduled for demolition. Therefore, no human health COCs were identified for the likely future land use.
- ▶ Under the most conservative land use (i.e., residential), no human health COCs were identified.
- ▶ Three ecoCOCs (HQ >1) (copper, iron, and lead) were identified in the surface water at Study Area 9. No ecoCOCs were identified with HQs >10.
- ▶ The concentrations of copper, iron, and lead in the surface water sample slightly exceeded the Alabama Department of Environmental Management (ADEM) criteria and National Ambient Water Quality Criteria (NAWQC) for these metals, however this structure would not be an impoundment following scheduled removal actions.
- ▶ The tar and contaminated sediments beneath the tar have been removed from Study Area 9.
- ▶ For the future likely land use scenarios (i.e, industrial and construction), no further action is recommended for sediments.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated iron concentrations in the sediments.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate remediation of the sediments.

- ▶ No further actions are required for surface water for the protection of human health, however it was recommended that the FS evaluate the surface water based on the ecological risk assessment.

5.9 Study Area 10 - Tetryl Manufacturing Area

The Tetryl Manufacturing Area consisted of 12 manufacturing lines where tetryl was produced in a 2-step process by first sulfating N-N-dimethylaniline and then nitrating the resulting intermediate. Lead was used in the piping, floors, and fittings of the four nitration houses. Lead scrap, as well as melted pieces of lead were abundant in the soil adjacent to most of the nitrating houses in the area. The buildings have been razed and rubble spread over areas about 80 feet on either side of the manufacturing lines. All that remained of each line were the concrete foundations of the buildings and the concrete wheeling walk that linked the process buildings. During the 1978 assessment, team members recovered explosive material from the soil surface.

Environmental Survey activities included the collection and analysis of seven soil samples. A high lead content was found in a sample taken near the nitrating house. Tetryl was found in low concentrations at the north tetryl nailing house and at high concentrations in the soils around the two drying and finishing houses. Two groundwater monitoring wells were installed. Diphenylamine was detected in one well, and tetryl was detected in the other well. A walk-through survey was conducted to observe the extent of soil contamination by asbestos. Extensive bulldozing scattered both types of asbestos-containing materials over an area covering approximately 200,000 square yards.

Two additional groundwater monitoring wells were installed during the Confirmatory Survey. Four groundwater samplings were collected, one from each well. Trace levels of tetryl were found in one of the wells.

Five soil samples were collected as part of the Remedial Investigation. Lead concentrations were below the detection limit in all five samples. Two groundwater samples were collected from existing monitoring wells. No nitroaromatics were present above the detection limit.

As part of the Supplemental Remedial Investigation, one down-gradient monitoring well was sampled. Nitroaromatic compounds and tetryl were detected in this sample.

Contaminated soils were removed from the Study Area under an IROD (OU3). Explosives contaminated soils were thermally treated and the ash was landfilled. Lead contaminated soils and ash were stabilized and landfilled. Asbestos was removed and transferred to a secure repository.

The Final Supplemental RI at Study Area 10 was divided between the eastern and western halves of the study area. Surface sampling locations at Study Area 10 were selected to determine if contamination extended into the eastern portion. Surface soil samples and subsurface soil samples were collected and screened for explosives in the field laboratory. Selected surface and subsurface soil samples were selected from the screening locations and sent to an offsite laboratory for analyses. All confirmatory samples were analyzed for metals, explosives, SVOCs, and VOCs. The results of the Final Supplemental RI, included:

Eastern Area

- ▶ Screening data did not indicate the presence of explosives in surface soils in the eastern half of the study area; this was confirmed by laboratory analysis of soil samples.
- ▶ Fifteen metals were detected at concentrations that exceeded background in surface soils at Study Area 10.
- ▶ In the human health risk assessment, manganese was identified as a COC under industrial and construction land uses.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include iron and manganese.
- ▶ Barium, lead, and manganese were identified as ecoCOCs (HQ >1) in surface soils. No metals were identified as ecoCOCs with HQs >10.
- ▶ No SVOCs or VOCs were identified as human health or ecological COCs.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), it was recommended that the FS evaluate elevated manganese concentrations in the surface soils.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated metals concentrations in the surface soils and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions required for elevated concentrations of metals in the surface soils.

Western Portion

- ▶ Five explosive compounds were detected in the soils sampled following remediation in the western portion of Study Area 10. Explosives were detected in 7 of 57 surface soil confirmatory samples. Tetryl was detected in 54 of 96 shallow subsurface soil samples (from depths at the bottom of the excavated areas). All tetryl concentrations were below 1,250 µg/g except one sample (2,939 µg/g).
- ▶ Lead was the only metal analyzed in soil samples collected as part of the remediation at Study Area 10–West. Lead was detected in all 49 surface soil and 103 shallow subsurface soil samples collected for confirmatory analysis. The maximum lead concentration detected was 2,000 µg/g in the surface soils and 400 µg/g in the subsurface soils.
- ▶ No human health COCs were identified for the industrial or construction future land use.
- ▶ Under the most conservative land use (i.e., residential), lead was identified as a human health COC.
- ▶ Lead was detected at concentrations that resulted in an HQ >10.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further action is required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated lead concentrations in the surface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions required for elevated concentrations of lead in the surface soils.

The western portion of Study Area 10 has been remediated by the excavation of tetryl contaminated soils. The soils were incinerated in an on-site treatment unit and lead contaminated soils have been stabilized on-site within Area B at a centralized location.

5.10 Study Area 16 - Flashing Ground

The Flashing Ground consisted of burning trenches that were active after World War II. According to the Installation Assessment, combustible trash and explosive materials were burned in this area.

Environmental Survey activities included the collection and analysis of 13 soil samples. Analytical results revealed the presence of lead, nitrocellulose, TNT, DNT, trinitrobenzene, and tetryl in all but one of the samples. Four groundwater monitoring wells were installed. Trace amounts of 2,4-DNT were found in one water sample. A walk-through survey was conducted to observe the extent of soil contamination by asbestos. Transite asbestos was found around the building that was located just inside the entry to the Flashing Ground. Small quantities of Transite materials were found along the burial pits on the western side of the area. No friable asbestos materials were found. Asbestos contamination is estimated to cover 65,000 square yards, with an estimated volume of 70,000 cubic yards.

Confirmatory Survey field sampling activity consisted of the installation of one groundwater monitoring well. Two groundwater samples were collected, one from the new well and one from a previously installed well. No residues were detected in either of the two groundwater samples.

Soil sampling was conducted as part of the Remedial Investigation. Of the 10 soil samples collected, three contained concentrations of lead greater than the extraction procedure toxicity criteria. Of the three groundwater samples planned, only one was collected due to a slow recharge rate. 2,4,6-TNT was detected in the sample.

Supplemental Remedial Investigation activities included installation of eight additional groundwater monitoring wells. Groundwater samples were collected from the eight new wells and from two existing wells. Nitroaromatic compounds were detected in 2 of the 10 water samples. Lead was detected in all but two of the wells sampled.

During the Final Supplemental RI, surface soil samples and subsurface soil samples from soil borings were collected at Study Area 16. Surface and subsurface soil samples were screened for explosives and lead. Selected soil samples were sent to the laboratory for analysis of metals, SVOCs, VOCs, and explosives. Surface water and sediment samples were also collected and analyzed. The Final Supplemental RI determined:

- ▶ Eighteen metals were identified as chemicals exceeding background (CEBs) in the soils sampled from Study Area 16.
- ▶ Lead was identified as a human health COC under the future construction and industrial land uses and was present at concentrations greater than the human health RGO. The presence of lead is attributed to the use of the area as a burning ground.

- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include TNT, three metals (arsenic, iron and lead) and five PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene).
- ▶ Ten metals (aluminum, arsenic, barium, cadmium, copper, lead, mercury, nickel, vanadium, and zinc) were identified as ecoCOCs (HQ >1). Aluminum, cadmium, and lead are the major contributors to ecological risks. Aluminum, cadmium, copper, lead, and vanadium were identified as ecoCOCs with HQs >10 and were present in the soils at concentrations greater than the ecoRGOs.
- ▶ One sediment sample was collected from a drainage area north of Study Area 16. Three metals were detected at concentrations that exceeded background. No explosives were detected.
- ▶ No human health COCs were identified for any of the likely future land uses because sediment exposures were not evaluated.
- ▶ No ecoCOCs were identified pertaining to sediments.
- ▶ Two explosive compounds, TNT (0.733 µg/L) and 2,4-DNT (4.5 µg/L), were detected in the surface water sample collected north of the Flashing Ground.
- ▶ Four metals were detected in a surface water sample at concentrations above background. Surface water exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs pertaining to surface waters were identified for the likely future land uses.
- ▶ Cobalt, iron, and manganese were identified as ecoCOCs (HQ >10). Cobalt and iron concentrations present in the surface water sample also exceeded the ecoRGOs.
- ▶ Iron was detected in the surface water sample collected at Study Area 16 at a concentration greater than the ADEM criteria and NAWQC. No SVOCs, VOCs, or explosives were identified as COCs.

Study Area 16 has been remediated by excavation of explosives- and lead-contaminated soils. The soils were treated by incineration (explosives and lead) and stabilization

(lead only). Some areas of lead-contaminated soils remain at concentrations that exceeded background. The maximum lead concentration detected in the surface soils was 5,400 µg/g.

- ▶ For the future likely land use scenarios (i.e., industrial and construction), it was recommended that the FS evaluate elevated lead concentrations in the surface soils.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated TNT, metals and PAH concentrations in the surface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate soil remedial actions.
- ▶ For the protection of human health, no further actions are required for sediments and surface water, however, based on the ecological risk assessment, remedial alternatives for the surface water should be evaluated in the FS.

5.11 Study Area 17 - Propellant Shipping Area

The shipping houses (Series 229 Buildings), used to store smokeless propellant prior to shipment, totaled 48 buildings. Thirteen of the 48 shipping buildings were located on land previously sold and these buildings were demolished prior to the sale. Contamination reportedly occurred from sweeping debris from the floor of the buildings onto the ground surface and by spills and breaks during the storage and shipping process.

Environmental Survey activities included the installation of one groundwater monitoring well. No nitroaromatics were detected in the groundwater sample. Soil sampling results revealed that only one building location had a concentration of 2,4-DNT above the detection limit and a low incidence of DNT and nitrocellulose. A walk-through survey was conducted to observe the extent of soil contamination by asbestos. All buildings in this area were covered with Transite shingles or panels. Because the buildings were not heated, steam lines were not present in this area and no friable asbestos was found. All 35 buildings which were within the present ALAAP boundary were inspected and spot tested for the presence of nitrocellulose. Selected samples were collected and spot tests conducted for nitroaromatic residues. Eighty-four percent of the spot tests were positive for nitrocellulose but were below the reportable detection limit. Only one spot test for nitroaromatic

compounds was positive, revealing a trace level of DNT at Shipping House 229-18. All buildings have subsequently been demolished.

Based on the findings of the Environmental Survey, the Confirmatory Survey and Remedial Investigation concluded that the contamination in the propellant shipping area was sufficiently defined; therefore, this study area was not evaluated in these reports.

During the Final Supplemental RI, surface soil samples and subsurface soil samples from soil borings were collected at Study Area 17 and screened for explosives. Five borings were placed in Study Area 17 and all depth intervals were screened for explosives. All confirmation samples were analyzed for metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ There was good correlation between the field screening data for explosives and laboratory confirmatory data collected during the Phase 1 Supplemental RI. These results indicated that explosives contamination of the surface soils was limited in areal extent and concentrated in localized hot spots. The localized hot spots subsequently were excavated and treated by onsite incineration.
- ▶ Fifteen metals were detected in soils at concentrations that exceed background. Manganese was identified as a human health COC under the future construction land use and was detected in one location at a concentration that exceeded the human health industrial and construction RGO.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include arsenic, iron and manganese.
- ▶ Aluminum, arsenic, barium, and manganese were identified as ecoCOCs (HQ >1). Aluminum was identified as an ecoCOC with an HQ >10 and was present at a concentration that exceeded the ecoRGOs in one sample. Aluminum is the major contributor to ecological risk with HQ >100.
- ▶ No VOCs or SVOCs were identified as COCs.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), it was recommended that the FS evaluate elevated manganese concentrations in the surface soils.

- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions required for elevated concentrations of ecoCoCs in the surface soils.

5.12 Study Area 18 - Blending Tower Area

The Environmental Survey activities consisted of an asbestos survey and soil sampling. Analysis of the soil sampling did not reveal nitroaromatic or organic base residues. Transite asbestos was found in this area around the foundations of demolished buildings. Bulldozing during building demolition scattered the transite material. Friable asbestos was not found in this area. Asbestos contamination in this area is estimated to cover 25,000 square yards. The Confirmatory Survey and Remedial Investigation concluded that the contamination in the blending tower area was sufficiently defined; therefore, this study area was not evaluated in these reports.

During the Final Supplemental RI, surface soil samples and subsurface soil samples from soil borings were collected. Soil samples were collected from these locations and screened for explosives. Five surface soil samples were selected and sent to the laboratory for confirmation analysis. The Final Supplemental RI determined:

- ▶ Screening data indicated that low concentrations ($<33 \mu\text{g/g}$) of explosives were present in soils in isolated areas. One soil sample collected for laboratory confirmatory analysis contained 2,4-DNT at a low concentration.
- ▶ No explosives, SVOCs, or VOCs were identified as soil COCs in either the human health or ecological risk assessment.
- ▶ Nine metals were detected in the soils at concentrations that exceeded background.
- ▶ No metals were determined to be human health COCs under the likely future industrial and construction land uses.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include arsenic, iron and manganese.

- ▶ Arsenic, chromium, manganese, and vanadium were identified as ecoCOCs (HQ >1). Chromium and vanadium were identified as ecoCOCs with HQs >10.
- ▶ For the future likely land use scenarios (i.e, industrial and construction) no further action is required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions for the presence of ecoCoCs in the surface soils.

5.13 Study Area 19 - Lead Remelt Facility

The old lead remelt facility was operated post 1973 during the demolition of the Teteryl Manufacturing Area, recovering lead from piping and equipment. At the time of the Environmental Survey, numerous large pieces of lead, some weighing several pounds, remained on the soil surface in this area. Sparse vegetation was observed, possibly caused by soil contamination. Environmental Survey activities included the collection and analysis of five soil samples which were found to contain significantly high levels of lead. A walk-through survey was conducted to observe the extent of soil contamination by asbestos. This area did not contain any Transite or friable asbestos.

Soil sampling was conducted as part of the Remedial Investigation. Analytical results for the samples were above the established extraction procedure toxicity criterion for lead.

During the Final Supplemental RI, nineteen surface soil and eleven subsurface soil samples were collected and screened for explosives. Fifteen sampling locations were screened for lead. Surface and subsurface soil samples were sent for confirmation analysis of metals, hexavalent chromium, explosives, SVOCs, and VOCs. The Final Supplemental RI determined:

- ▶ Five metals were present in the soils at concentrations above background.
- ▶ No explosives, SVOCs, or VOCs were identified as COCs.

- ▶ No human health COCs were identified for the likely future land uses (i.e., industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs included only arsenic.
- ▶ No COCs were identified as a result of the ecological risk assessment.
- ▶ Lead contaminated soils have been removed from this study area.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further actions are required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated arsenic concentrations in the surface soils.
- ▶ For the protection of ecological resources, no further actions are required.

5.14 Study Area 20 - Rifle Powder Finishing Area

Environmental Survey activities included a walk-through asbestos survey and soil sampling. Of the nine soil samples analyzed, six contained significant concentrations of 2,4-DNT. The asbestos survey found Transite asbestos around all building foundations and scattered throughout the area, covering an estimated 140,000 square yards. Friable asbestos was found along all former steam line routes.

Based on the findings of the Environmental Survey, the Confirmatory Survey and Remedial Investigation concluded that the contamination in the rifle powder finishing area was sufficiently defined; therefore, this study area was not evaluated in these reports. The Remedial Investigation concluded that no significant contaminant migration occurs in the surface or ground waters as a result of past industrial activities.

During the Final Supplemental RI, seven surface soil and four subsurface soil samples were collected and screened for explosives. Confirmatory samples were analyzed for metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ Field screening data for surface soils indicate that explosives were not present above the detection limit of 2.5 µg/g. Field screening of subsurface soils detected explosives at a concentration of 13 µg/g. Low concentrations

(less than 1.13 µg/g) of 2,4-DNT were confirmed in surface and subsurface soils through confirmatory analysis.

- ▶ No explosives, SVOCs, or VOCs were identified as COCs.
- ▶ Fifteen metals were detected at concentrations that exceed background.
- ▶ No human health COCs were identified under the industrial and construction land use exposure scenarios.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs included only iron.
- ▶ Aluminum, arsenic, barium, and chromium were identified as ecoCOCs (HQ >1). Aluminum and chromium were identified as ecoCOCs with HQs >10. Aluminum was present in the soils at a concentration that exceeded the ecoRGO at this study area.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further action is required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated iron concentrations in the subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate remedial actions required for elevated concentrations of metals in the surface soils.

5.15 Study Area 21 - Red Water Ditch

The Red Water Ditch carried the industrial process wastewaters produced by the manufacture of tetryl and TNT. The Red Water Ditch also collected industrial process wastes and surface runoff from the acid/organic manufacturing area (Study Area 8) and the tetryl manufacturing area (Study Area 10). Much of the original ditch has been excavated as a part of the remedial actions completed under the IROD for Area B - Operable Unit 3.

As initially constructed, the Ditch extended from the western side of the Tetryl Manufacturing Area through the Northern TNT Manufacturing Area (Study Area 7), and the Southern TNT Manufacturing Area (Study Area 6). Industrial wastes generated in the

Acid/Organic Manufacturing Area were discharged into the ditch immediately east of Building 806C (Northern TNT Manufacturing Area). The areas drained by the Red Water Ditch were involved in the production of acids (sulfuric and nitric), organics (diphenylaniline, aniline, and N,N-dimethylaniline), and explosives (TNT, DNT, and tetryl) and their process byproducts. Other organics and inorganics (benzene, toluene, sodium sulfite, and elemental sulfur) were also stored in these areas.

After production at the plant ended, the Red Water Ditch contained flowing water (surface runoff) only during wet periods. During dry periods, the ditch contained water in only ponded locations. The Red Water Ditch was constructed with steep sides and had a depth that varied from approximately 3 to 10 feet. The ditch was cleaned at least once since its original construction. Sediments dredged from the ditch during the cleaning operations were deposited along the ditch. When intersecting other drainage systems, the Red Water Ditch crosses the other systems through vitrified pipes. The Red Water Ditch drainage system carried approximately 17 percent of the surface water at ALAAP, which was ultimately discharged into the Coosa River.

The Environmental Survey conducted sampling activities along the Red Water Drainage Ditch System. The survey concluded that the waters were contaminated by low levels of nitroaromatic compounds where the ditch traverses the Southern and Northern TNT Manufacturing Areas and by diphenylamine immediately downstream of the outfall that discharges from the Acid/Organic Manufacturing Area. In addition, inorganic contamination (lead, nitrate, and sulfate) was present in two sampling locations. Waters in the middle section of the Red Water Ditch were contaminated by low levels of 2,4-DNT, 2,6-DNT, and TNT. Diphenylamine was detected immediately downstream from the main Acid/Organic Manufacturing Area discharge point. Asbestos fibers were also found in the surface water. The sediments from the Northern TNT Manufacturing Areas to the crossover point are contaminated by TNT, as are the sewers and soils adjacent to the ditch in the Southern and Northern TNT Manufacturing Areas.

Sediment and soil samples were conducted as part of the Remedial Investigation. Low concentrations of 2,4,6-DNT were found in two of the three sediment samples. Soil sample analytical results showed 2,4,6-DNT in all five samples and extractable lead in two of the three samples analyzed for this contaminant. Although plans were made to collect and analyze one surface water sample, this was not possible due to dry conditions.

During the Supplemental Remedial Investigation, four surface water samples and four sediment samples were analyzed. No nitroaromatic compounds or tetryl concentrations were found in any of these samples. According to the Remedial Investigation the drainage system is contaminated with nitroaromatic compounds. However, these sediments have

been buried by channel wall erosion and sedimentation and do not contribute to surface water contamination. Low levels of nitroaromatic compounds were detected in the upstream surface waters of the Red Water Ditch during the Environmental Survey. Runoff from the spoil piles and occasional discharge from contaminated sewer lines were identified as the source of the low levels of nitroaromatic compounds present.

The contaminated portions of the Red Water Ditch as well as the industrial sewer lines which fed into the ditch were removed under an IROD (OU3). Confirmation sampling on the remaining portions of the ditch were completed during the Final Supplemental RI. A total of 236 sediment samples were collected from 47 transects along the Red Water Ditch and screened for explosives and lead. All confirmation samples were laboratory analyzed for metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ Seventeen metals were detected in the sediments in the remaining ditch at concentrations that exceed background.
- ▶ Aluminum, arsenic, barium, lead, mercury, molybdenum, and vanadium concentrations are highest in the northern tributary of the Red Water Ditch and may be associated with either the tetryl or acid/organic manufacturing areas. The lower portions of this tributary have been remediated for explosives.
- ▶ Sediment exposures were not evaluated under the likely future land use. Therefore, no industrial or construction land use COCs were identified in sediment.
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified.
- ▶ Five metals (arsenic, chromium, copper, lead, and manganese) were identified in the sediments as ecoCOCs (HQ >1). None of these metals was identified as an ecoCOC with an HQ >10.
- ▶ Pyrene and acetone were identified in the sediments as ecoCOCs (HQ >1) but they were not identified as ecoCOCs for HQs >10.
- ▶ While screening data indicated that low concentrations of explosives were present in sediments, only one sample of 256 collected samples contained explosives exceeding 100 µg/g. This sample was collected in the portion of the tributary that previously had been remediated. Laboratory analyses of

sediment samples collected in the unremediated portions of the ditch confirmed that explosives were not present in the surface sediments above concentrations of 4 µg/g.

- ▶ Nine metals were detected at concentrations above background in surface water samples collected.
- ▶ No explosives or SVOCs were detected in the surface water sampled at Study Area 21. Aluminum, barium, iron, and manganese were identified as ecoCOCs (HQ >1). Aluminum, barium and manganese were identified as EcoCOCs with HGs >10.
- ▶ Surface water collected from Study Area 21 contained iron and lead at concentrations that exceeded the ADEM surface water criteria. Exceedances of the NAWQC were confirmed in surface water for aluminum, iron, and lead.
- ▶ Surface water exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land uses (industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified, however arsenic and Aroclor 1254 were identified as COCs in fish tissue.
- ▶ For the future likely land use scenarios (i.e, industrial and construction), no further action is required for protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), no further action is required for sediments. However, remedial action alternatives for the surface water should be evaluated based on COCs identified in fish tissue.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate remedial actions for sediment and surface water.

5.16 Study Area 22 - Demolition Landfill

This disposal area, located near the flashing ground, consists of a semicircular landfill in a swale extending approximately 500 feet along Patrol Road. Rubble from demolition activities

was dumped at this site in a 50 foot-wide semicircle around the edge of the swale to an average depth of approximately 6 feet. Soil contamination at this study area is attributed to burial of construction debris following the burning of buildings within Area B. Several hundred pounds of lead were found on the surface in the form of sheets, wire, and pipe. Large amounts of cast iron, stainless steel fittings, aluminum, Transite, and other rubble were partially buried by concrete and earth. Friable asbestos was also distributed in the soil of this area. Soil sampling identified lead residues in concentrations above background in two samples and a small concentration of tetryl.

Remedial Investigation sampling activities consisted of the collection and analysis of five soil samples. Results showed elevated levels of lead; however, none were above the established extraction procedure toxicity criterion.

During the Final Supplemental RI, three surface soil and six subsurface soil samples from three soil borings were collected and screened for lead. Selected samples were also analyzed for metals, explosives, VOCs, SVOCs and hexavalent chromium. The Final Supplemental RI determined:

- ▶ Eighteen metals were detected in soils at concentrations that exceed background and lead contamination extends to a depth of 20 feet in some locations. PAHs were detected at shallower depths.
- ▶ Based on the construction and industrial land use exposure scenario human health COCs include arsenic, lead and six PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene).
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include five metals (arsenic, hexavalent chromium, iron, lead and manganese) and eight PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene).
- ▶ Four metals (lead, mercury, nickel, and zinc) were identified as ecoCOCs (HQ >1). Lead and zinc were ecoCOCs with HQs >10 and were detected in the soils at concentrations that exceeded the ecoRGOs.
- ▶ Soil contamination at this study area is attributed to burial of construction debris following the burning of buildings within Area B.

- ▶ Following completion of the Phase 1 Supplemental RI, a recommendation was made to cap the landfill. The landfill was capped in October, 1998 and no further actions are required other than periodic maintenance of the engineered cap and groundwater monitoring.

5.17 Study Area 25 - Storage Battery/Demolition Debris

During a June 1985 site visit a previously undocumented disposal site, found during controlled hunting during the fall of 1984, was identified. Inspection of the disposal site indicated the presence of rubble and a number (at least 20) of heavy-duty lead acid battery casings. These consisted of approximately 30 pounds of lead components in a glass casing. Along with the batteries, several mercury switches, each containing a small amount of mercury (liquid), were observed. The disposal site was located in a steep, overgrown ditch bank and is periodically flooded by backwater from the Coosa River.

During the Remedial Investigation, soil and groundwater samples were collected. Nine soil samples were collected and analyzed. Arsenic, chromium, copper, lead, nickel, thallium, zinc, and 2,4,6-TNT were found in the soil at concentrations below the extraction procedure toxicity criteria used to define hazardous waste.

During the Final Supplemental RI, three surface soil and six subsurface soil samples from three borings were collected and screened (quick turn) for lead and analyzed in the laboratory for metals, explosives, VOCs, and SVOCs. The Final Supplemental RI identified:

- ▶ Eighteen metals were detected in soils at concentrations above background.
- ▶ No human health COCs were identified for the likely future land uses (i.e., industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include iron and manganese.
- ▶ Arsenic, chromium, vanadium, and zinc were identified as ecoCOCs (HQ >1); chromium and vanadium were identified as ecoCOCs with HQs >10.
- ▶ Based on site observations and analytical data, it was recommended that the batteries and debris that remain at this study area be removed.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further action is required for protection of human health.

- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for the elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate actions required for elevated concentrations of metals in the surface soils.

5.18 Study Area 26 - Crossover Ditch

The Crossover Ditch was not identified as a study area until the Remedial Investigation, although the area was investigated during the Confirmatory Survey. The Crossover Ditch drains surface waters from the Leaseback Area, the Rifle Powder Finishing Area, the Blending Tower Area, part of the northern and all of the southern portions of the Propellant Shipping Area, the southern portion of the Southern TNT Manufacturing Area, and the Sanitary Landfill and Lead Facility.

Although the Crossover Ditch drains areas that produced nitrocellulose and smokeless powder, contaminants from other sources may have entered this drainage system. Potential sources of other contaminants include the coal pile at the U.S. Alliance Power Plant, the Sanitary Landfill and Lead Facility, and the large Industrial Waste Reservoir on U.S. Alliance land directly south of the Rifle Powder Finishing Area. It is estimated that the Crossover Ditch collects and discharges into the Coosa River approximately 25 percent of the surface waters generated on or adjacent to ALAAP property.

During the Environmental Survey, lead, cadmium, copper, and zinc were found in samples of surface water. The upper reaches of the Crossover Ditch had an iron oxide film on the water surface and iron staining of the sediments and aquatic vegetation, due to the impact of the coal pile. No detectable explosives-related contaminants were found. Asbestos fibers were found in the surface water. Analysis of 17 sediment samples showed residues from coal pile runoff in the upper reaches and evidence of coal pile particulate runoff throughout. DNT was found in all 17 samples.

Two sediment samples were collected and analyzed as part of the Remedial Investigation. A concentration of 2,4-DNT was found in one sample; in the second, a concentration of lead was found, but it was below extraction procedure toxicity criterion. It was not possible to take a surface water sample, due to dry conditions.

The Remedial Investigation concluded that no significant contaminant migration occurs in the surface waters as a result of past industrial activities at the study area. According to the Remedial Investigation, the drainage system is contaminated with nitroaromatic compounds. However, these sediments have been buried by channel wall erosion and sedimentation and do not contribute to surface water contamination. The low levels of nitroaromatic compounds found in the surface water during the Environmental Survey can be attributed to spoil pile runoff and sewer leakage.

Supplemental Remedial Investigation field activities included the collection and analysis of four surface water samples. No detectable concentrations of nitroaromatic compounds or tetryl were found in any of the samples.

During the Final Supplemental RI, 396 sediment samples were collected from 75 transects and screened in the field for explosives. In addition, at four locations, hand augers were used to collect samples to 5 feet BLS at 1-foot intervals. These samples also were screened for explosives. Forty-two samples along nine transects were collected for confirmation analysis of metals, explosives, VOCs, and SVOCs. The Final Supplemental RI determined:

- ▶ Twenty-one metals were detected in the sediments at concentrations that exceeded background.
- ▶ The highest concentrations of arsenic in sediments within Area B were detected in the southern tributary of the Crossover Ditch that runs east of Study Area 2 and originates offsite, south of the Area B boundary.
- ▶ No significant concentrations of explosives (maximum of 22.1 µg/g) were detected in any of the sediment transects sampled and screened from the Crossover Ditch. This was verified through laboratory confirmatory analysis of samples collected at nine locations across this study area.
- ▶ Sediment exposures were not evaluated under the likely future land uses (i.e., industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified.
- ▶ Three metals (arsenic, chromium, and manganese) were identified as ecoCOCs (HQ >1). No metals were identified as ecoCOCs for HQs >10.

- ▶ No explosives or SVOCs were identified as sediment COCs at the Crossover Ditch.
- ▶ Seven metals were detected in surface water at concentrations above background.
- ▶ No SVOCs, VOCs, or explosives were identified as surface water COCs.
- ▶ Surface water exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land use.
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified in the surface water. However, mercury was identified as a COC in fish tissue.
- ▶ Aluminum, barium, iron, and manganese were identified as ecoCOCs (HQ >1) to aquatic biota. Barium and manganese were ecoCOCs with HQs >10 and were detected in the surface water at concentrations that exceeded the ecoRGOs.
- ▶ Iron was detected in the surface water at concentrations that exceeded the ADEM surface water criteria.
- ▶ For protection of human health, no further action was recommended.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), nor further action for sediments is required. However, remedial action alternatives for the surface water should be evaluated based on mercury identified as a COC in fish tissue.
- ▶ For protection of ecological resources, remedial action alternatives for surface water and sediment should be evaluated.

5.19 Study Area 27 - Beaver Pond Drainage System

The Beaver Pond Drainage System was not identified as a study area until the Remedial Investigation, although the area was investigated prior to this. The Beaver Pond Drainage System flows west between the Southern and Northern TNT Manufacturing Areas and derives its name from three large beaver ponds that have greatly changed the original ditch. The drainage system is a natural system that collects surface runoff from areas of planted

trees and grassland. It originates in undeveloped areas south and east of the tetryl manufacturing area.

Potentially contaminated surface runoff in the Beaver Pond Drainage System originates from the southern end of the Tetryl Manufacturing Area and the Shipping Houses. Some surface drainage from the Acid/Organic Manufacturing Area, the Tetryl Manufacturing Area, and the Northern TNT Manufacturing Area now enters the Beaver Pond Drainage System. The system accounts for approximately 20 percent of the surface waters discharged from ALAAP. Water is retained year-round in the three ponds, but these ponds have emptied on occasions due to breaches in the dams.

The Environmental Survey conducted surface water sampling which found that the waters of the drainage system appear to be uncontaminated except for one location, the groundwater seepage in the Northern TNT Manufacturing Area, where the sample contained TNT. Asbestos fibers were also found. No contaminants flowed from ALAAP through this drainage system. Sediment samples showed concentrations of nitroaromatic compounds.

Surface water sampling activities were conducted as part of the Confirmatory Survey. Levels of 2,4,6-TNT and 2,4-DNT that were detected in the stream water were below applicable criteria.

As part of the Remedial Investigation, one water sample was collected and analyzed. All compounds analyzed were below the detection limits.

Supplemental Remedial Investigation field activities included the collection and analysis of four surface water samples and four sediment samples. None of these samples contained detectable concentrations of nitroaromatic compounds or tetryl.

During the Final Supplemental RI, a total of 135 sediment samples were collected from 28 transects along the Beaver Pond Drainage System and were screened for explosives. In addition, at three locations, samples were collected at three locations with hand augers at 1-foot intervals to a depth of 5 feet BLS. Fifteen samples, five from each of three transects, were collected along the Beaver Pond Drainage System for confirmation analysis. Four additional sediment samples were collected, two each from the East and West Beaver Ponds. The Final Supplemental RI determined:

- ▶ Fifteen metals were detected in the sediments at concentrations that exceeded background.

- ▶ Sediment exposures were not evaluated under the likely future land uses (i.e., industrial and construction) therefore no human health COCs were identified.
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified.
- ▶ Metals, including arsenic, chromium, lead, manganese, and zinc, were identified as ecoCOCs (HQ >1). No ecoCOCs were identified with HQs >10.
- ▶ Explosives screening data showed limited detections of explosives (maximum of 41.8 µg/g). These results were verified through laboratory confirmatory analysis of sediment samples; target explosives were not detected in any of the sediment samples collected. One nontarget explosive (HMX) was detected at a concentration of 0.215 µg/g in one sediment sample collected from this study area.
- ▶ Seven metals were detected in surface water at concentrations that exceeded background.
- ▶ Eight explosives were detected in surface water sampled from a location between the east and west Beaver Ponds. The explosives included 2,4-DNT, 2,6-DNT, TNT, and explosive breakdown products.
- ▶ Surface water exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land use.
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified in the surface water.
- ▶ Aluminum, barium, iron, and manganese were identified as ecoCOCs (HQ >1) to aquatic biota. Barium and manganese were ecoCOCs with HQ >10 and were detected in the surface water at concentrations that exceeded the ecoRGOs.
- ▶ Iron and lead were detected in the surface water at concentrations that exceeded the ADEM surface water criteria.

- ▶ For the future likely land use scenarios (i.e, industrial and construction), no further action is required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), no further action is required.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate remedial actions for sediment and surface water.

5.20 Industrial Sewer System

The Industrial Sewer System for the entire plant was originally investigated in the Environmental Survey. The industrial sewer lines within Area B totaled approximately 32,500 feet in length, of which approximately 31,000 feet remained buried. The Remedial Investigation defined the nature and extent of contamination within the Industrial Sewer System in the four former production areas (Northern and Southern TNT Manufacturing Areas, Tetryl Manufacturing Area, and Acid/Organic Manufacturing Area) at ALAAP. A total of 98 soil samples from within and outside the Industrial Sewer System, 14 sediment samples, and 7 water samples from within the surface drainages were collected and analyzed. Sampling results found varying concentrations of nitroaromatics compounds present throughout the samples areas. A Feasibility Study was conducted based on the results of the Remedial Investigation. All manhole structures and much of the ISS was removed during an action under an IROD for Operable Unit 3. The remaining pipe was cleaned and closed in place and no further actions are required.

5.21 TC4A, TC4B & Concrete Slab - Stockpile Soils

Structures TC4A, TC4B and a Concrete Slab contained contaminated soil that was excavated from Area A and placed in Area B pending incineration. TC4A and TC4B were buildings and the Concrete Slab was a membrane-covered concrete storage pad. Contaminated soils from Area A (adjacent property) were removed between 1986 and 1987. In February 1990, a tornado demolished Building TC4B. Soils from the demolished building were added to the Concrete Slab and secured with the membrane liner. In February 1991, a feasibility study was conducted for the Stockpile Soils Area. The study concluded that explosives, lead, and asbestos contamination were present above regulatory limits. A feasibility study was conducted in July 1991 and an Interim Record of Decision was released in December 1991 (Operable Unit 2). The selected remedy for the Stockpile Soils Area was to thermally treat and dispose of the soil onsite. All soils have been treated and the buildings have been dismantled and the slab decontaminated.

5.22 Additional Areas Identified by the Community Environmental Response Facilitation Act (CERFA) Investigation

The new areas described below were identified during the CERFA investigation. These new areas of environmental concerns were associated with CERCLA-related environmental issues and identified through on-site inspections, personnel interviews, and record searches. These areas have only been investigated during the Final Supplemental RI.

5.22.1 Building 6-Coke Oven

The Coke Oven was partially constructed during the 1950's era plant update but was never finished. The structure included a concrete-covered pit of unknown dimensions beneath a concrete slab located next to the main structure. According to the CERFA report, the slab was used as a burning pad during demolition activities. Transformer oil was reportedly poured onto copper wire to burn off the insulation covering the copper. It is unknown whether the transformer oil contained any PCBs. The concrete pad is still present and the pit is not accessible.

Ten surface soil three subsurface soil samples were collected at the Coke Oven during the Final Supplemental RI. Soil samples were screened for explosives and analyzed for metals, VOCs, SVOCs, and explosives at a laboratory. The Final Supplemental RI concluded that:

- ▶ Seventeen metals were detected at concentrations that exceeded background. None of these metals was identified as a human health COC under the likely future land uses (i.e., industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include arsenic, iron and manganese.
- ▶ Aluminum, arsenic, lead, and zinc were identified as ecoCOCs (HQ >1). Aluminum was identified as an ecoCOC with an HQ >10.
- ▶ Explosives were not detected in screening samples collected from surface soils covering the area; subsurface soils contained low concentrations of explosives (<5 µg/g) when screened in the field. One nontarget explosive compound (HMX) was detected in a confirmatory surface soil sample at a concentration of 0.518 µg/g. The source of HMX in the soils is unknown and may be a laboratory artifact as HMX was never produced or used at the facility. Explosives were not identified as human health or ecological COCs.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further action is required for the protection of human health.

- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), the FS should evaluate actions required for elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate the presence of ecoCoCs in the surface soils.

5.22.2 Downed Utility Poles with Transformers and Transformer Storage Buildings

During the CERFA visual inspection a downed utility pole was noted. The soil under and around the broken transformer was blackened and bare of vegetation. The CERFA Report stated that numerous such sites existed within Area B and identified their location on a map. None of the transformers had been tested for PCB contamination. A total of 27 sites were identified, all located within the southern section of the General Services Administration Area except for one located in the Smokeless Powder Manufacturing Area. These sites were assigned a number that corresponds to the closest building and are listed below.

708A: Three utilities poles are located north of Building 708A.

703E: Two utility poles are located along the northwest portion of Building 703E.

703A: Two utility poles are located along the southwest portion of Building 703A and one at the southeast corner.

2240: Eight utility poles are located south of Building 2240 (which is titled Purchased Power).

2170: One utility pole is located near the southeast corner of Building 2170 with two more located south of the building.

704Y: Three utility poles are located north of Building 704Y, one directly north and two northeast.

717A: Two utility poles are located along the northeast portion of Building 717A, and one is located southwest of the building.

715C: One utility pole is located off the southeast corner of Building 715C.

227D: One utility pole is located north of Building 227D, in the Smokeless Powder Manufacturing Area.

According to the CERFA Report, transformers were at one time stored behind Building 2240, an instrument shop. However there was no evidence of stressed vegetation during the site inspection. It was also reported that a leaking transformer was stored in Building 2180, part of the Manhattan Project Area, and was removed in 1987. When demolition activities began in Area A around 1973-1974, the contractor stored transformers removed from Area A in Building 2180. The report states that when the transformers were removed, cleanup activities by the contractor consisted of throwing absorbent on any liquids present.

Surface soils were collected during the Final Supplemental RI from each of the 27 utility pole areas and 2 transformer buildings and six subsurface soil samples were collected from one soil boring. The Final Supplemental RI concluded that:

- ▶ Eleven metals were detected in the subsurface soils at concentrations that exceeded background.
- ▶ Under the likely future land uses (i.e., industrial and construction), Arochlors 1248, 1254 and 1260 were identified as human health COCs.
- ▶ Under the most conservative future land use (i.e., residential), Arochlors 1248, 1254 and 1260 were identified as human health COCs.
- ▶ Two PCBs (Aroclor 1248 and 1254) were identified as ecoCoCs with HQs >1. No ecoCoCs with HQs >10 were identified.
- ▶ Screening and confirmatory samples fully characterized the extent of contamination from the transformer poles. The contaminated area is limited to surface soils in the vicinity of the downed transformers. Although the ecological HQs are <10, PCBs are persistent and bioaccumulate.
- ▶ It was determined that remediation of the PCB-contaminated soils was required. Excavation and disposal of the impacted soils was conducted in September and October, 1999 and a closure report was prepared.

5.22.3 Underground Storage Tanks and Gas Stations

According to the CERFA Report two Underground Storage Tanks were recently removed, one near Building 302B and one near a flammable materials storehouse, Building 715C. One contained gasoline and the other contained diesel fuel; they each had a capacity of 12,000 gallons.

One Gas Station listed in the Inventory of Military Real Property was located in Area B. Building 724E is described as a Gas Station without a building (i.e., pump stations). The only information available stated that the Underground Storage Tanks were installed in 1942. All Underground Storage Tanks have since been removed.

To investigate the potential for residual fuel contamination resulting from USTs and operations at the Gas Station, 12 subsurface soil sampling locations were established at the site during the Final Supplemental RI. In addition, one soil boring was drilled in the vicinity of the former UST at the Guard Post Two. Subsurface samples were collected from the boring. All soil samples were analyzed for metals and SVOCs. The Final Supplemental RI concluded that:

- ▶ Fourteen metals were detected in soils at concentrations that exceed background. None of these metals was identified as a human health COC under the likely future land uses (i.e., industrial and construction). Ecological risk assessments were not conducted because all of the soil samples were collected from depths of 1 foot BLS or deeper.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include iron and manganese.
- ▶ PAHs were detected at one location at a depth of 5 feet BLS. None of the PAHs was identified as a human health COC.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further action is required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate elevated metals concentrations in the subsurface soils.
- ▶ For the protection of ecological resources it was recommended that no further action is required.

5.22.4 Pesticide Storage Building

According to the CERFA Report, Building 223B was used to store fertilizers and pesticides. It was leased out approximately 20 years ago by the Parker Fertilizer Company in Sylacagua, Alabama, for storage and there were no reported releases.

During the Final Supplemental RI, five surface soil samples were collected in the yard area of the Fertilizer and Pesticide Storage Building to identify potential releases from activities conducted at the building. Six subsurface soil samples were collected from two soil borings. All samples were analyzed for metals, pesticides, and PCBs. The Final Supplemental RI concluded that:

- ▶ Eighteen metals, nitrate and phosphate were detected in soils at concentrations that exceed background in soils.
- ▶ Iron was identified as a COC for the future construction and industrial land uses.
- ▶ Under the most conservative land use scenario (i.e., residential), human health COCs include iron and manganese.
- ▶ Six metals were identified as ecoCOCs with HQs >1. Aluminum and chromium were ecoCOCs with HQs >10.
- ▶ Pesticides were not detected in surface or subsurface soils around the former storage building. Adequate samples were collected in the vicinity of the building to conclude that the soils around the building are not currently contaminated with pesticides.
- ▶ For the future likely land use scenarios (i.e., industrial and construction), it was recommended that the FS evaluate actions required for elevated iron concentrations in the subsurface soil.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), it was recommended that the FS evaluate actions required for elevated metals concentrations in the surface and subsurface soils.
- ▶ For the protection of ecological resources it was recommended that the FS evaluate remedial actions for elevated metals concentrations in the surface soil.

5.23 Summary of Area B Groundwater Results

Groundwater underlying ALAAP flows through relict fractures, joints, voids, and bedding in karst limestone and dolomite residuum and weathered bedrock. Groundwater level records indicate that precipitation infiltrates rapidly to the water table across the installation with

concurrent water level changes observed in both soil and bedrock wells. These results confirm that a well-developed macropore system of relict joints, fractures, voids, and bedding occurs in the residuum and that Area B is a recharge area for the underlying aquifer. Measured aquifer hydraulic conductivity beneath the installation ranges across eight orders of magnitude from 7.6×10^{-1} to 6.28×10^{-8} cm/sec.

Groundwater movement occurs predominantly to the northwest toward the Coosa River across the industrial portion of Area B. A groundwater divide exists, extending to the northeast from the southeastern corner of Area B. Available site information indicates that groundwater discharge is to the Coosa River, although substantial preferential subsurface flow paths are documented within 10 miles of ALAAP. Localized redirection of groundwater occurs in the topographically complex portion of Area B east of the groundwater divide in the vicinity of Study Areas 16 and 19 (Flashing Ground and Lead Facility).

The groundwater underlying Area B contains frequently detected organic and inorganic constituents (i.e., explosives and metals) that are attributable to previous activities on ALAAP. Elevated concentrations of nitroaromatic constituents, including 2,4-DNT, 2,6-DNT (2,6-DNT), and TNT occurs in the southern portion of Area B between Study Areas 17 and 18 (Propellant Shipping Area and Blending Tower Area) and extending north toward Study Area 6 (Southern TNT Manufacturing Area). Another area of groundwater contamination occurs in the southwestern corner of Area B and is associated with elevated concentrations of 2,4-DNT and TNT. These wells are downgradient from the former smokeless powder manufacturing area at the Alliance Coosa Pines facility (formerly Kimberly-Clark Corporation).

Groundwater containing nitroaromatic compounds also is found at isolated well locations in Study Areas 7, 8, and 10 (Northern TNT Manufacturing Area, Acid/Organic Manufacturing Area, and Tetryl Manufacturing Area). Due to preferential flow paths in the karst aquifer, some of these areas may reflect downgradient "slugs" of the larger contaminant areas or may be related to other localized contaminant sources across the installation.

Additional nitroaromatic compounds detected in the groundwater at Area B include 1,3,5-trinitrobenzene (1,3,5-TNB), 1,3-dinitrobenzene (1,3-DNB), nitrobenzene, and isomers of nitrotoluene. The nitroaromatic breakdown products 2-A-4,6-DNT and 4-A-2,6-DNT also were detected. Nitroaromatic compounds and lead were detected in bedrock wells. Although a precise source for the explosives is not currently known.

Trace concentrations of VOCs and SVOCs were detected during groundwater analyses, including 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), toluene, phenol, PCP,

carbon tetrachloride, chloroform, and PAHs. Several concentrations of organic chemicals exceed MCLs, including carbon tetrachloride, PCP, B2EHP, and vinyl chloride.

The spatial distribution of lead concentrations in the groundwater at Area B was similar to the observed patterns for the nitroaromatic compounds, suggesting a common source area. Lead concentrations in Area B exceed the EPA action level (15 µg/L at the tap) for lead in groundwater. Arsenic concentrations in Area B groundwater did not correspond with other detected organic or inorganic compounds and exceeded the EPA MCL of 50 µg/L at well D-7B.

In the area east of the groundwater divide, the groundwater in the vicinity of Study Areas 16 and 19 (Flashing Ground and Lead Facility) contains nitroaromatic compounds (2,4-DNT, TNT, and 2,6-DNT), metals, VOCs (acetone, toluene, 1,1,1-TCA, and xylene), and a variety of SVOCs.

The groundwater beneath the main industrial portion of Area B contains concentrations of nitroaromatics and metals that would result in risks exceeding EPA targets if the untreated groundwater were used for household purposes. Metals (arsenic, beryllium, lead, and nickel) and organics (carbon tetrachloride, PCP, B2EHP, and vinyl chloride) were detected at concentrations that exceed the MCLs. In the human health risk assessment, groundwater exposures were not considered to be likely under the industrial or construction land use scenarios. For this reason, groundwater exposures were not evaluated under these land use scenarios. Drinking water for Area B currently is supplied by the county water treatment plant which would likely continue under future industrial or construction land use. However the baseline human health risk assessment indicates that the risks to hypothetical residential users of the groundwater exceed the risk-based limits established in the NCP. Exposure to groundwater for the ALAAP ecological receptors was not considered significant and was not evaluated quantitatively in the ecological risk assessment.

Because of the elevated concentrations of nitroaromatic compounds and lead in the groundwater within Area B, additional investigations are underway to determine the extent of contaminant migration, the potential for risks to offsite receptors, and the feasibility of groundwater remediation. A separate report with recommendations addressing these issues relative to the groundwater contamination will be prepared at the conclusion of the ongoing investigations.

5.24 Summary of Supplemental RI Results for Talladega Creek and the Coosa River

The Coosa River and Talladega Creek were investigated during the Final Supplemental RI to determine if surface runoff or groundwater migration were resulting in adverse environmental impacts to the water bodies.

5.24.1 Talladega Creek

- ▶ Eight metals were detected in sediments at concentrations exceeding background.
- ▶ Arsenic, copper, lead, and manganese were identified as ecoCOCs (HQ >1). No ecoCOCs were identified with HQs >10.
- ▶ Human health exposure to sediment was not evaluated under the likely future land uses (i.e., industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified in the sediments.
- ▶ Screening results indicate that significant explosives contamination of the Talladega Creek sediments is not present; these results were verified through laboratory analyses of sediment samples. The maximum concentrations of three CEB metals, two explosives, and toluene were detected in the tributary draining Study Areas 16 and 19.
- ▶ Metals concentrations in surface water samples from Talladega Creek did not exceed background.
- ▶ No VOCs or pesticides were detected in the surface water. Trace concentrations of explosives have been detected.
- ▶ Surface water exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land use.
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified in the surface water.
- ▶ No ecoCOCs were identified for the Talladega Creek surface water.

- ▶ It was recommended that no further actions be required for the sediments in Talladega Creek based on the human health and ecological risk assessments. No further actions are required for surface water, based on the likely future land use. Based on the ecological risk assessment, no further actions are required for the Talladega Creek surface water. Additional investigations are underway to determine if groundwater contaminants can reach or bypass the creek via subsurface migration.

5.24.2 Coosa River

- ▶ Eleven metals were detected in sediments at concentrations exceeding background.
- ▶ Human health exposure to sediment was not evaluated under the likely future land uses (i.e., industrial and construction).
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified in the sediments.
- ▶ Mercury was identified as an ecoCOC (HQ >1). Mercury was not identified as an ecoCOC with an HQ >10.
- ▶ Screening results indicate that significant explosives contamination of the Coosa River sediments is not present. These results were verified by laboratory analyses of sediment samples.
- ▶ Three metals (aluminum, arsenic, and iron) were detected at concentrations that exceeded background in the surface water.
- ▶ Explosives were not detected in the samples collected from the surface water of the Coosa River.
- ▶ Surface water exposures were not evaluated under industrial and construction future land uses. Therefore, no human health COCs were identified for the likely future land use.
- ▶ Under the most conservative land use scenario (i.e., residential), no human health COCs were identified in the surface water.
- ▶ Aluminum was identified as an ecoCOC (HQ >1). The HQ for aluminum did not exceed 10 in the Coosa River samples.

- ▶ For the future likely land use scenarios (i.e., industrial and construction), no further action is required for the protection of human health.
- ▶ For the protection of human health based on the most conservative land use scenario (i.e., residential), no further action is required.
- ▶ The ecological risk assessment results suggests that evaluation of the sediment and surface water COCs should be conducted in an FS. However, since additional investigations are underway relative to groundwater contamination, no further actions are required.

5.25 Summary of Final Supplemental RI Biota Results

Explosives were not detected in any of the tissue samples from crayfish, fish, or rabbits collected from ALAAP. Low concentrations of a number of SVOCs (bis(2-ethylhexyl)phthalate, 4-methyl phenol, and benzoic acid) also were detected in background samples and may not be site related. Metals appear to be the predominant contaminants taken up through ALAAP biological organisms.

Two metals (mercury and cobalt) were detected in crayfish at concentrations exceeding background. Cobalt was identified as a potential CEB because it was not detected in the background samples. Cobalt was detected in only one crayfish sample. Mercury concentrations in crayfish collected from both the Crossover Ditch and the Beaver Ponds were higher than background. Concentrations detected in crayfish from Talladega Creek were similar to those detected in background crayfish.

Low concentrations of metals were present in fish collected from the creeks on Area B of ALAAP. Fish collected from the Red Water Ditch contained nine metals that exceeded background. This correlates with the high numbers of metals detected at concentrations exceeding background in sediments. Selenium was the only metal detected at concentrations exceeding background in fish collected from the Crossover Ditch. There were five metals that were CEBs in fish collected from the Beaver Ponds; four of these metals (manganese, nickel, cobalt, and chromium) also were CEBs in fish collected from the Red Water Ditch. Two metals (chromium and lead) were detected at concentrations exceeding background in fish collected from Talladega Creek.

Seven SVOCs were detected in fish. Of these, two (4-methyl phenol and bis(2-ethylhexyl)phthalate) also were detected in the fish collected at background locations. Three SVOCs were detected in fish and crayfish at low concentrations and include benzoic acid, phenol/carbolic acid/hydroxybenzene, and benzyl alcohol. Two compounds may be site related (2-methylnaphthalene and naphthalene/tar camphor) because they were only

detected in fish collected from the Talladega Creek tributaries. Aroclor 1254 was detected in only 1 of the 42 fish samples analyzed. Six metals were detected at concentrations exceeding background in rabbits. The major metals of concern were copper and arsenic, which were detected in rabbits from nearly all locations sampled. The highest concentrations accumulated in tissue were 0.25 $\mu\text{g/g}$ arsenic and 1.2 $\mu\text{g/g}$ copper, both in rabbits collected from Study Area 17 (Propellant Shipping Area). bis(2-Ethylhexyl)phthalate was also detected in rabbits collected from Study Area 17 at a maximum concentration of 1.09 $\mu\text{g/g}$.

6.0 Off Post Pathways of Concern

6.1 Existing or Potential Pathways of Contamination Migration

Topographic and hydrogeological information for the ALAAP was reviewed to assess potential contamination migration pathways onto the property from adjacent properties. This information was used in combination with data on potential contamination sources on adjacent and surrounding property to determine if there were any existing or potential environmental impacts on the ALAAP property from offsite sources. Contamination source data was obtained through record searches, review of existing environmental reports, personnel interviews, and property site visits. The results of these adjacent and surrounding property evaluations are described below.

Potential pathways of contamination onto the ALAAP property are from stormwater runoff and groundwater migration. Drainage onto the ALAAP property occurs in several locations. The Crossover Ditch collects and discharges into the Coosa River approximately 25 percent of the surface waters on or adjacent to the ALAAP property. Potential contaminants from adjacent properties include the U.S. Alliance Power Plant Coal Pile, Sanitary Landfill, and a Large Industrial Water Reservoir. In general, groundwater flow onto the ALAAP property is from the north and west. The direction of groundwater flow is from the topographically higher areas in the northeast portion of the parcel toward the Coosa River to the west and the Talladega Creek to the southeast. A steep groundwater gradient slopes from the upland areas to the lowland areas where the groundwater flow is divided by the Coosa River and Talladega Creek.

6.2 Environmental Concerns from Adjacent and Surrounding Properties

A records search to identify potential offsite contamination sources for the ALAAP facility of Federal and State data bases was conducted. The search indicated the following:

- ▶ The Beaunit Corporation, which lies in the industrial park north of ALAAP, went out of business in 1972. The area is currently under CERCLA review. No other information is available concerning the Beaunit Corporation.
- ▶ Wesley Industries, Inc., also in the industrial park, is a RCRA generator and is required to submit air emissions reports.
- ▶ No hazardous spills were reported within the zip code area of the ALAAP.
- ▶ The former Kimberly Clark Corporation is a RCRA generator, has a National Pollution Discharge Elimination System permit for release to surface water, and is required to submit air emissions reports.

7.0 Future Land Use Scenario

In order to effectively structure and execute the Remedial Action Plan for ALAAP, the projected outcome or reuse of ALAAP is essential. Environmental cleanup standards are a function of the projected or future use of ALAAP. This section selects the future land use for ALAAP.

7.1.1 Area A

Area A was auctioned on May 10, 1990 and was conveyed to the new owners on August 31, 1990 for unrestricted use. Currently Area A is used as a hunting preserve and timber source.

7.1.2 Area B

Area B is currently in an inactive caretaker status with controlled access. The only activity occurring on ALAAP is occasional Army-supervised logging and the ongoing environmental investigations. The land surrounding ALAAP is a mixture of recreational and industrial activity. The property is currently scheduled to be transferred to the city of Childersburg. Proposed land use will be industrial, retail and recreational. Future land usage will be in accordance with the completed cleanup criteria.

7.2 Adjacent and Surrounding Properties

Land use in the vicinity of ALAAP is a mix of residential, agricultural, recreational, industrial, and rural usages. Residences are buffered from the ALAAP by other industry or extensive undeveloped or wooded areas. Three farms border the installation and a small residential community lies several thousand feet southeast of it, next to Talladega Creek; an estimated 40 residents live within 1 to 2 miles. The property is surrounded as follows:

North: A small industrial park, owned by Talladega County, lies north of the installation. A wastewater pump and filter station are located in this area. The Beaunit Corporation was at one time located in this industrial park.

South: A paper plant, located on land south of the site, is the site of an operational paper products mill (formerly Kimberly Clark). The leaseback area is also located here.

East: The McDonald Land Company is conducting wildlife management and research on the property (formerly Area A) and plans to leave it undeveloped.

West: The Coosa River flows west of the site and the property, which is bordered by a golf course.

7.3 Land Reuse Scenarios

Based upon the existing documentation and the surrounding landuse, the following three future reuse scenarios were evaluated: residential, industrial, and hunter/wildlife preserve. The following is the selected reuse for each parcel.

7.3.1 Area A

Area A is currently being used as a hunting/wildlife preserve. However, in 1991 the property was transferred to a new owner for unrestricted use. Based on the property transfer agreement, remedial investigation/action efforts were/are predicted on a residential future land use. All cleanup operations associated with this property have been completed and a final closure report has been prepared.

7.3.2 Area B

It is the expressed intent of the Childersburg Local Redevelopment Authority to utilize the remaining property located at the Alabama Army Ammunition Plant to provide long term job creation through the development of as large as feasibly possible industrial park on the site. The City of Childersburg LRA has already begun the process of planning, marketing, and engineering necessary to make this an attractive site to future industry locating within the region. A conceptual master plan was developed around a phased approach for redevelopment so that the capital investment necessary to make this a reality would not adversely effect other public services provided by the City of Childersburg.

8.0 General Approach

8.1 Programmatic Strategy

This SMP had been developed to allow efficient use of funding and time for remedial response activities at ALAAP and had been revised on an annual basis to reflect ongoing operations. As investigations are almost completed and the property is scheduled to be released to the City of Childersburg, this is the final issuance of this report.

8.2 Implementation Strategy

The primary implementation strategy planned for the RI/FS activities at ALAAP was the division of the facility into two major study areas (Area A and Area B). Each of these areas are further subdivided into operable units. Each area is being addressed by a continuous, concurrent and decisive program of remedial investigation, feasibility study, administrative action (Proposed Plan and Record of Decision), remedial design, remedial construction/implementation, and operation and maintenance of the installed remedies that support the reuse strategy described in section 7.0.

8.2.1 Area A

Operable Unit 1: Area A Soils and Groundwater.

Operable Unit 2: Study Areas 12 and 30 Interim Soils Response.

All actions within Area A have been completed and a final Record of Decision has been signed.

8.2.2 Area B

Operable Unit 1: Area B Soils and Groundwater.

Operable Unit 2: Stockpiled Soils (remediation completed).

Operable Unit 3: Study Areas 6, 7, 10 and 21, ISS Interim Soil Response (remediation completed).

Operable Unit 4: Study Areas 2, 10, 16, 17, 19 and 22 Interim Soil Response (remediation completed).

The overall listing and schedule of remedial response activities and deliverable for each Operable Unit are shown in Figures 8-1 through 8-5 and Figures 8-A through 8-E. The SMP is designed to follow the general approach established by actions to date at the installation. Specifically, a complete RI/FS has either been planned or completed to

address all major study areas and sub-units contained within the facility and which will lead to permanent remedies. Concurrently, the plan provides for focusing feasibility determinations for accelerated actions within specific study areas or subunits as data become available. This strategy will continue to allow implementation at the earliest opportunity of interim or early remedial responses which ultimately contribute to the permanent solution.

8.3 Scheduled General Activities

The SMP schedule shows the approximate time-phasing and expected duration of each major work activity through the projected end of active environmental investigations. As it is anticipated that the cleanup of the groundwater at the site will not be possible, long-term monitoring of the groundwater will be required after the preparation of the final ROD.

The RI/FS was planned to address all major study areas and subunits, transport media, and potentially impacted environmental systems at the facility and beyond. Studies determined both human health and environmental risks posed by contaminated soil, groundwater, surface water, sediments, and air; and feasible methods for mitigation or prevention of adverse effects. The potential impact to biotic populations and ecosystems was evaluated by studies of effects on indigenous species and habitats, as well as, toxicity studies on contaminated media. A full range of potentially feasible remedial alternatives including source removal or control, leachate control, transport control, treatment and prevention of exposures have been evaluated.

The complexity of the facility hydrogeology, the proximity to sensitive ecosystems and human populations, the wide range of contaminant concentrations, and the broad areas encompassed by potential sources at the facility may require specific research and development (R&D) efforts with the goal of generating improved methods both for characterizing each site (e.g., methods for sampling and analysis) and for evaluating or developing potential remedies (e.g., methods for removal, treatment, and control of wastes or contaminated media). Such efforts of a basic research nature have not been included in this SMP, and only applied research to evaluate the feasibility of treatment process options has been included in the SMP at appropriate points. In view of the broad contaminant classes and contamination levels, it has been assumed that long-term monitoring, deed restrictions and institutional controls will be required as the permanent remedies for groundwater.

A program review for each ROD will be conducted every five years by EPA, State of Alabama and the Army in accordance with CERCLA requirements as necessary.

8.4 Detailed Description of Planned Activities

This section provides a description of planned activities and time-phasing of the various work elements for each Operable Unit within each Major Study Area. A complete RI/FS for each major study area will be conducted to provide the baseline information required to select and design the appropriate remedial response. This program will be conducted in full compliance with the NCP and will proceed through an initial planning stage, associated R&D efforts, one or more phases of field studies and assessments, and will lead to a Proposed Plan, and a Record of Decision. The activities following the Record of Decision are the design, construction, and implementation of the selected remedy.

8.4.1 Area A

Area A Soils and Groundwater, (Area A, OU1):

On August 31, 1990 the ownership of Area A was conveyed from the Army to a new owner. The Army transferred the property for unrestricted use with contractual obligation. To investigate and remediate Area A to that end. From 1991 through 1994 the Army completed a Supplemental RI/FS, separate Baseline Risk Assessment and a Proposed Plan. However, in December 1993 (during the final approval of the Area A, Record of Decision), EPA Region IV identified investigative shortfalls that require additional characterization efforts to meet the Army's requirement of unrestricted use in Area A. An agreement was reached between the Army and EPA to revise the RI/FS Report based on additional data collected from the installation of new groundwater monitoring wells, resampling of existing monitoring wells, collection of background soil samples, and the collection of additional soil samples from each of the Study Areas. All investigations have been completed at Area A and a Final Record of Decision was approved in January, 1997. Cleanup activities are completed and the final Closure Report has been submitted to the regulatory agencies.

Figure 8-1 shows the schedule of remedial response activities for Area A, OU1. Figure 8-A shows required deliverables for Area A, OU1.

Study Areas 12 and 30 Interim Soils Response, (Area A, OU2):

The Supplemental Investigation of Area A concluded that there are two sites within Area A that required remedial action. Areas 12 and 30 both posed unacceptable risk for unrestricted use. In order to expedite the restoration, the Army, EPA and State of Alabama decided to continue on with the remediation process of Areas 12 and 30 as a separate Interim Operable Unit for Area A (OU2). The selected remedy for Study Area 12 and 30 was completed in December 1994. This action was incorporated into the final ROD for Area A and no further activities are required as a part of this OU.

Figure 8-2 shows the schedule of remedial response activities for Area A, OU2. Figure 8-B shows required deliverables for Area A, OU2.

8.4.2 Area B

Area B Soils and Groundwater (Area B, OU1):

From 1990 through 1994 the Army completed a Supplemental RI and a separate Baseline Risk Assessment for Area B. However, EPA Region IV review of the Draft Final FS identified investigative shortfalls that require an additional characterization effort. The additional characterization of Area B includes the installation of additional monitoring wells and soil borings; re-sampling of existing monitoring wells; collecting background and site-specific soil samples, and surface water samples. Following the site characterization, the Army shall submit an addendum RI/FS for regulatory review followed by the Area B Proposed Plan and Record of Decision. Figure 8-3 shows the schedule of remedial response activities for Area B, OU1. Figure 8-C shows required deliverables for Area B, OU1.

Stockpile Soils (Area B, OU2):

Contaminated soils from Area A were removed between 1986 and 1987. This contaminated soil was then placed in structures TC4A and TC4B in Area B pending incineration. In February 1991, a FS was conducted for the stockpile soils area. The study concluded that explosives, lead, and asbestos contamination were present above regulatory limits. A feasibility study was conducted in July 1991 and a Record of Decision was released in December 1991. The selected remedy for the stockpile soils was completed in December 1994. Figure 8-4 shows the schedule of remedial response activities for Area B, OU2, all which have been completed. Figure 8-D shows required deliverables for Area B, OU2.

Study Area 6,7,10, 21 and ISS Interim Soils Response (Area B, OU3):

The Supplemental Remedial Investigation of Area B and Baseline Risk Assessment concluded that there are four sites within Area B that required remedial action. Areas 6,7,10 and 21 all posed unacceptable risk. In order to expedite the restoration program and utilize the on-site transportable incinerator currently incinerating Stockpile Soils (Area B, OU3) the remediation of Areas 6,7,10 and 21 has been segregated into a separate Interim Operable Unit for Area B (OU3). This interim action began in December 1994 and was completed in 1996. Figure 8-5 shows the schedule of remedial response activities for Area B, OU3, all which have been completed. Figure 8-E shows required deliverables for Area B, OU3.

Study Area 2,10,16,17,19 and 22 Interim Soils Response (Area B, OU4):

The Supplemental Remedial Investigation of Area B and Baseline Risk Assessment concluded that there were six additional sites within Area B that required remedial action.

These areas all posed unacceptable risk. In order to expedite the restoration program and utilize the on-site transportable incinerator the remediation of these areas was been segregated into a separate Interim Operable Unit for Area B (OU4). This interim action began in December 1994 and was completed in 1999. Figure 8-6 shows the schedule of remedial response activities for Area B, OU4. Figure 8-F shows required deliverables for Area B, OU4.

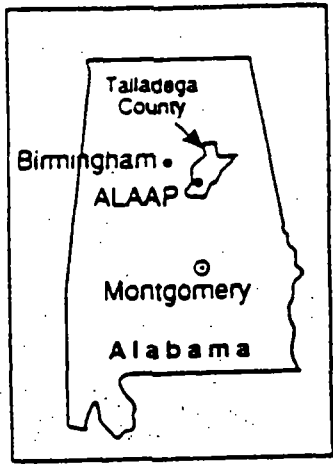
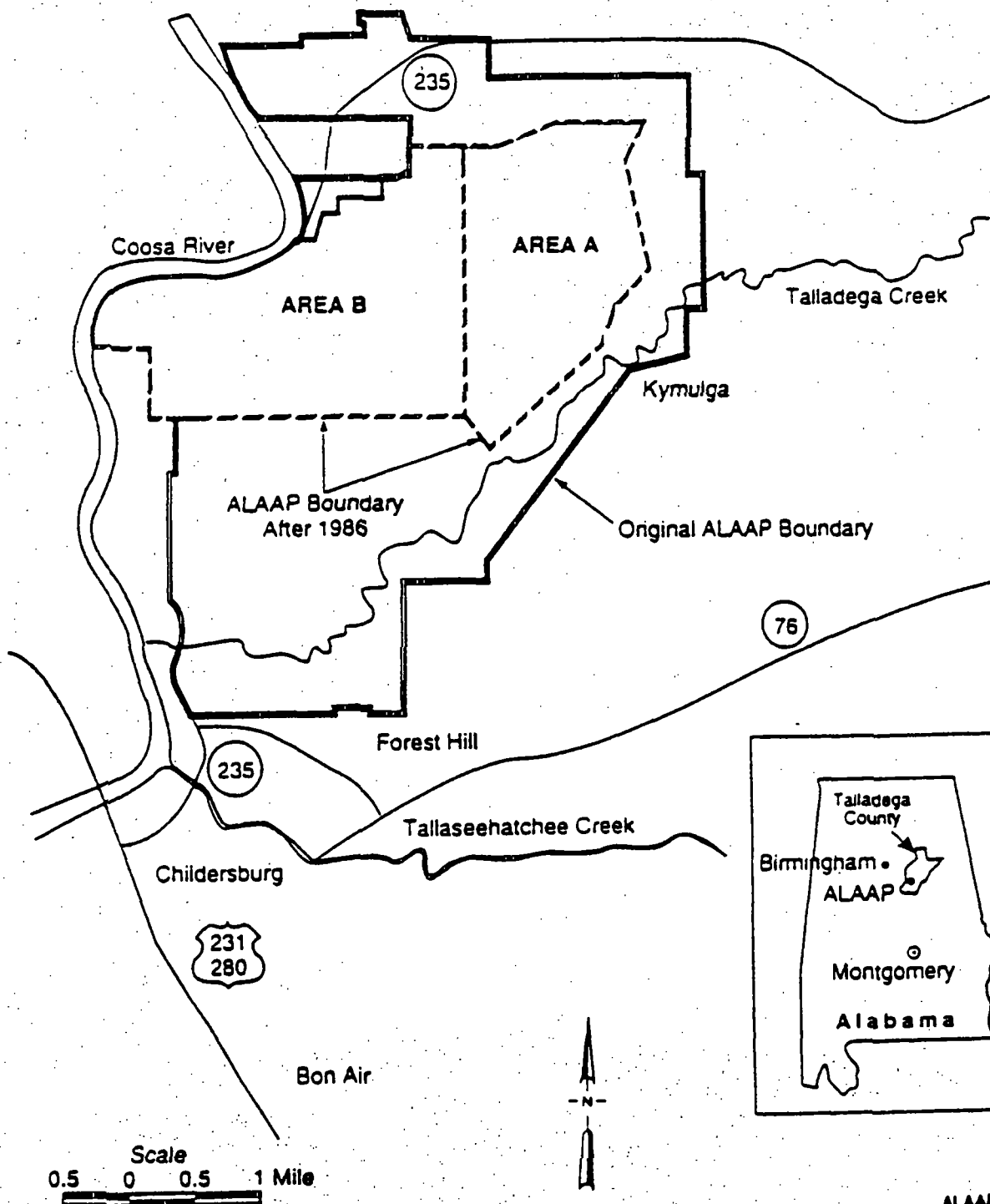
8.5 Interim Action Program Elements

The long-term remedies resulting from the RI/FS process described in section 8.3 will be accomplished in the shortest time possible, given the length of time required for planning, accomplishment, and administrative actions. As data on the various study areas become available and as risks are evaluated, it may be necessary to consider additional interim or early actions as contributions to the permanent remedies for each site. This plan includes the potential that interim or early remedies will be evaluated for each defined study area. Potentially feasible interim or early remedies will be implemented in accordance with EPA regulation for conducting Non-Time Critical Removal Actions with an accelerated schedule of accomplishments and approvals led by up-front agreements and prior approvals by the parties to the Federal Facility Agreement.

8.6 Removal Actions

During the course of the investigation process at ALAAP, releases or threats of release may be discovered that will threaten public health or the environment within a length of time shorter than that in which the remedial program can respond. In this situation, it is necessary and appropriate to use removal action authority to quickly abate or remove the threat. If removal actions are required, the Army will act as the lead agency and will conduct the removal action in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Superfund Amendments and Reauthorization Act (SARA), National Contingency Plan (NCP), EPA Region IV, and State of Alabama guidance.

GENERAL LOCATION MAP
ALAAP



ALAAP FS

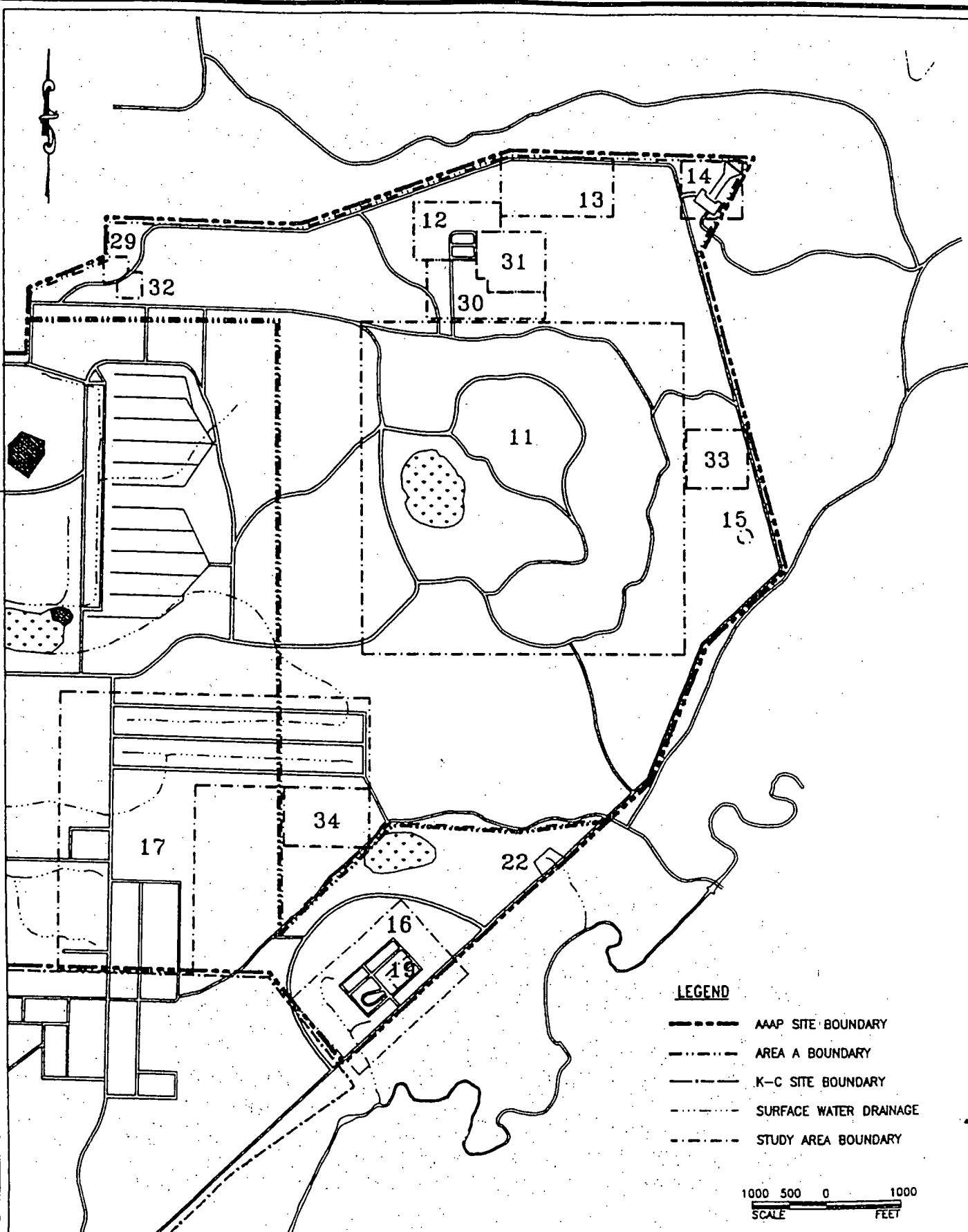


U.S. ARMY ENVIRONMENTAL CENTER
ALABAMA ARMY AMMUNITION PLANT
CHILDERSBURG, ALABAMA

ALAAP Location Map

Figure No.	Project No.	File Name	Date
	01-0827-03-8178-045	99015\DWGS\E42F1-1	03-31-99

STUDY AREA MAPS
ALAAP



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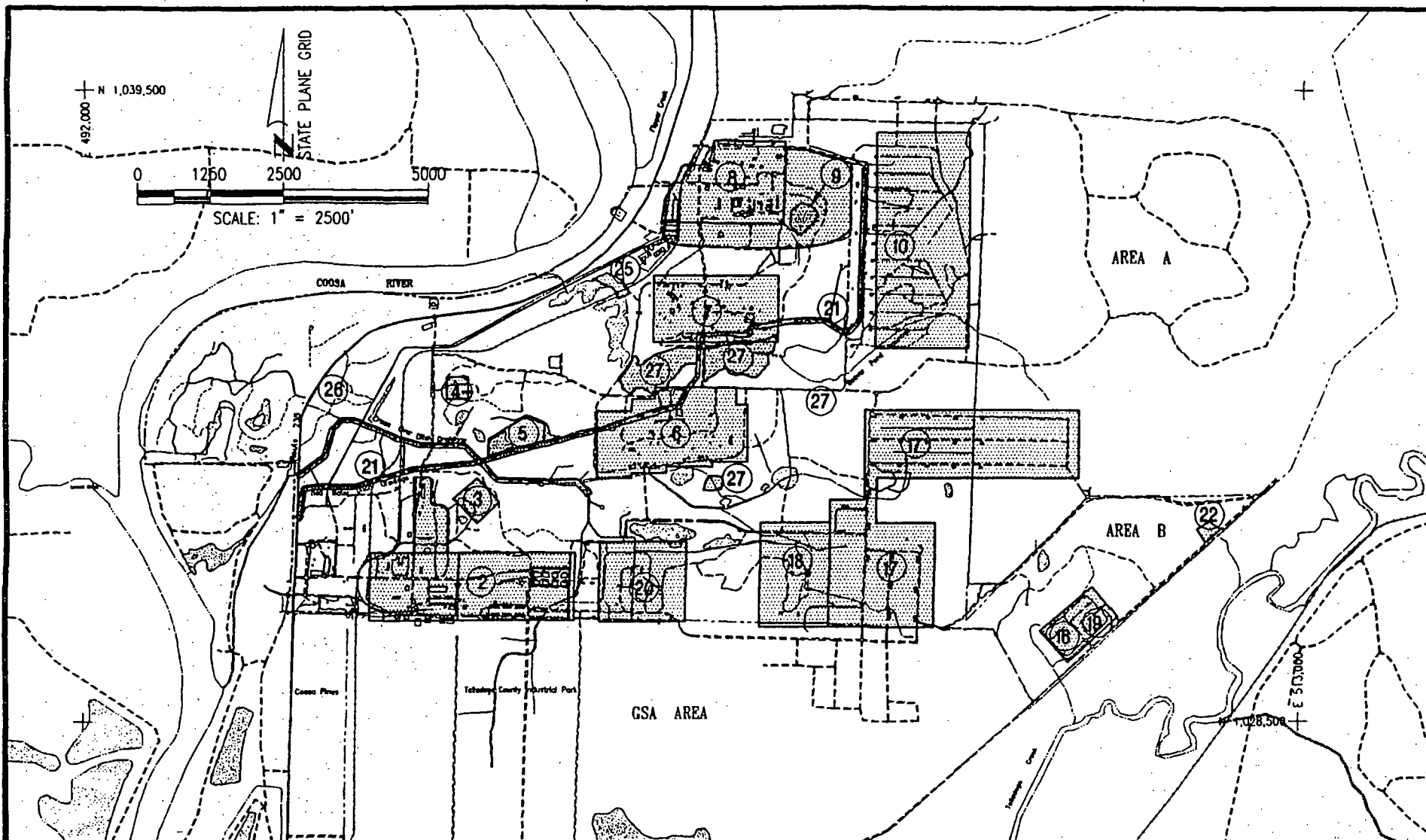
STUDY AREAS
WITHIN AREA A

Source : ESE, 1995.

Project No. : 398359-1100
Date : June 1996
Drawn By : D.J.T./M.G.M.
Checked By : M.J.G.
Approved By : M.J.G.

**U.S. ARMY
ENVIRONMENTAL CENTER**

**ABERDEEN PROVING
GROUND, MARYLAND**



LEGEND:

- AREA A BOUNDARIES
- AREA B BOUNDARY
- PRIMARY ROADS
- SECONDARY ROADS
- TRAILS
- BUILDINGS
- FENCE
- RAILROAD
- WETLANDS
- CREEK AND TRIBUTARIES
- PONDS, IMPOUNDMENTS



- STUDY AREAS
- GRID BASED ON ALABAMA STATE PLANE EAST

NOTES:

1. BASE MAP OF AREA B RECEIVED FROM AIR SURVEY CORP. MAP COMPILED FROM AERIAL SURVEY FEBRUARY 1995.
2. OUTSIDE AREAS OF BASE MAP RECEIVED FROM AMERICAN DIGITAL CARTOGRAPHY SCANNED FROM USGS CHILDERSBURG 7.5 QUADRANGLE, 1984, 1" = 100,000'.



U.S. ARMY ENVIRONMENTAL CENTER
ALABAMA ARMY AMMUNITION PLANT
CHILDERSBURG, ALABAMA

Area B Study Areas

Figure No.	Project No.	File Name	Date
1	01-0827-03-8178-090	94029\DWGS\178BASE	04-08-97

**ALAAP SITE MANAGEMENT PLAN
TABLES**

**ALABAMA ARMY AMMUNITION PLANT
AREA A SOILS AND GROUNDWATER (AREA A OU1)
PROGRAMMATIC SCHEDULE**

TABLE 8-1

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
Army awards investigative contract		Actual date completed	05/01/94
Army submits addendum RI/FS work plans letter, Version 1	EPA/ADEM	Actual date completed	05/02/94
EPA/ADEM provides approval, addendum RI/FS work plans letter	Army	Actual date completed	05/13/94
Field work begins, Version 1	Army	Actual date completed	05/16/94
Army submits Interim Draft RI/FS Report.	Army	Actual date completed	09/28/94
Army submits Addendum RI/FS Work Plan letter, Version 2	EPA/ADEM	Actual date completed	02/23/95
Additional field work begins, Version 2	Army	Actual date completed	03/06/95
Additional field work completed, Version 2	Army	Actual date completed	04/14/95
Army submits Draft RI Report, (all inclusive)	EPA/ADEM	Actual date completed	12/10/95
EPA/ADEM provides comments for the Addendum Draft RI Report	Army	Actual date completed	10/20/95
Army submits Addendum Draft FS Report	EPA/ADEM	Actual date completed	08/20/95
Army submits the Addendum Final RI Report	EPA/ADEM	Actual date completed	09/10/95
EPA/ADEM provides comments for the Addendum Draft FS Report	EPA/ADEM	Actual date completed	09/20/95
EPA/ADEM provides approval of the Addendum Final RI Report	Army	Actual date completed	10/10/95
Army submits Addendum Final FS Report	Army	Actual date completed	10/10/95
EPA/ADEM provides approval of the Addendum Final FS Report	EPA/ADEM	Actual date completed	11/10/95
Army submits Draft PP	EPA/ADEM	Actual date completed	12/10/95

Table 8-1
(continued)

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
EPA/ADEM provides comments for the Draft PP	Army	Actual date completed	01/10/96
Army submits Final PP	EPA/ADEM	Actual date completed	01/25/95
EPA/ADEM provides approval of the Final PP	Army	Actual date completed	02/10/96
Public comment period begins	All	Actual date completed	02/20/96
Public comment period ends	All	Actual date completed	03/30/96
Army submits Draft ROD	EPA/ADEM	Actual date completed	04/30/96
EPA/ADEM provides comments on Draft ROD	Army	Actual date completed	04/30/96
Army submits Final ROD	EPA/ADEM	Actual date completed	01/15/97
EPA/ADEM/Army approves/signs, Final ROD	All	Actual date completed	03/27/97
Army submits Draft RD/RA Work Plan	EPA/ADEM	Actual date completed	09/23/97
Army submits Final RD/RA Work Plan	EPA/ADEM	Actual date completed	10/20/97
Army begins RA	Army	Actual date completed	10/25/97
RA complete	Army	Actual date completed	05/31/98
Army submits RAR Report	EPA/ADEM	Actual date completed	09/10/98
EPA/ADEM/Army approves RAR	EPA/ADEM	60 days after receipt	11/10/98
Final site inspection	Army/EPA/ADEM	Actual date completed	11/19/98
Army submits Close-Out Report (COR) to ADEM/EPA	Army	Actual date completed	03/19/99
EPA/ADEM provide comments on COR	EPA/ADEM	60 days after receipt	pending

Table 8-1
(continued)

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
Army submits final COR	ARMY	15 days after receipt of comments	pending
EPA approves/signs COR	EPA	60 days after receipt	pending
ADEM provides letter of concurrence	ADEM	Concurrent with EPA approval of COR	pending
Deletion docket placed in site repository and delivered to EPA	ARMY	15 days after approval of COR	Pending
Notice of Intent to Delete (NOID) published in Federal Register and local papers	EPA	15 days after approval of COR	Pending
Public comment period	All	30 days after publication of NOID	Pending
Prepare Responsiveness Summary	Army/EPA	15 days after close of comment period	Pending
Publish Notice of Deletion in Federal Register	EPA	15 days after completion of responsiveness summary	Pending

ALABAMA ARMY AMMUNITION PLANT
STUDY AREA 12 AND 30 INTERIM RESPONSE ACTION (AREA A OU2)
PROGRAMMATIC SCHEDULE

TABLE 8-2

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
Army Submits Draft Interim ROD For Areas 12 and D	EPA/ADEM	Actual date completed	05/13/94
EPA/ADEM Provides Comments on Interim ROD	ARMY	Actual date completed	06/13/94
Army Submits Final Interim ROD	EPA/ADEM	Actual date completed	06/23/94
EPA/ADEM/ARMY Approves and Signs Interim ROD	EPA/ADEM ARMY	Actual date completed	09/09/94
Army Submits Remedial Design /Remedial Action Work Plan	EPA/ADEM	Actual date completed	07/06/94
EPA/ADEM Provides Comments/ Approval on RD/RA work Plan	ARMY	Actual date completed	08/05/94
Army Submits Final RD/RD Work Plan	EPA/ADEM	Actual date completed	8/10/94
EPA/ADEM Provides Approval of RD/RA	ARMY	Actual date completed	08/10/94
RA Begins	Army	Actual date completed	08/10/94
RA Completed	Army	Actual date completed	12/07/94
Army Submits RAR	EPA/ADEM	Actual date completed	02/27/95

Table 8-3
(continued)

ALABAMA ARMY AMMUNITION PLANT
AREA B SOILS AND GROUNDWATER (AREA B OU1)
PROGRAMMATIC SCHEDULE

TABLE 8-3

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
Army awards investigative contract	Army	Actual date completed	06/15/94
Army submits Draft Addendum RI/FS Work Plans	EPA/ADEM	Actual date completed	09/30/94
EPA/ADEM provides comment, Draft Addendum RI/FS Work Plans	Army	Actual date completed	01/12/94
Army submits Final Addendum RI/FS Work Plans	EPA/ADEM	Actual date completed	05/15/95
EPA/ADEM provides approval of the Final Addendum RI/FS Work Plans	Army	Actual date completed	06/15/95
Field work begins	Army	Actual date completed	03/06/95
Field work completed	Army	Actual date completed	08/15/95
Army submits Addendum Draft RI Report	EPA/ADEM	Actual date completed	02/29/96
Army submits Addendum Draft FS Report	EPA/ADEM	Actual date completed	03/25/96
Army completes Phase II RI field work	Army	Actual date completed	07/26/96
Army completes Phase III RI field work	Army	Actual date completed	01/23/97
Army submits Final RI/FS Report for Soils, Sediments and Surface Water	Army	Actual date completed	02/01/99
Army submits Final Groundwater Work Plan	Army	Actual date completed	02/16/01
Army provides Final RI Report for Soils, Sediments and Surface Water	Army	45 days after resolution of regulatory comments	8/01/01
Army submits Final Soils FS/Technical Memorandum	Army	Anticipated date of submittal	9/26/02
Completion of Field Investigation/Groundwater	Army	Anticipated	9/30/02
Final Proposed Plan - Soils	Army	Anticipated	1/28/03
Final Groundwater RI Report	Army	Anticipated	3/29/03
Final Groundwater FS Report	Army	Anticipated	8/26/03
Final Groundwater Proposed Plan	Army	Anticipated	11/9/03
Final Groundwater ROD	Army	Anticipated	3/27/04
Final Long-Term Monitoring Plan	Army	Anticipated	1/23/04

**ALABAMA ARMY AMMUNITION PLANT
STOCKPILED SOILS (AREA B OU2)
PROGRAMMATIC SCHEDULE**

TABLE 8-4

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
EPA/ADEM/Army approved, Final ROD	All	Actual date completed	12/01/91
EPA/ADEM Provides approval for Final RD/RA Work Plan	Army	Actual date completed	03/04/94
Army begins RA	Army	Actual date completed	04/09/94
RA complete	Army	Actual date completed	12/07/94
Army submits Remedial Action Report	EPA/ADEM	Actual date completed	02/13/95

ALABAMA ARMY AMMUNITION PLANT
STUDY AREAS 6, 7, 10 AND 21 SOIL RESPONSE (AREA B OU3)
PROGRAMMATIC SCHEDULE

TABLE 8-5

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
Army submits Draft Interim ROD	EPA/ADEM	Actual date completed	07/20/94
EPA/ADEM provides comments on Draft Interim Final ROD	Army	Actual date completed	09/16/94
30 day public comment period begins	Public	Actual date completed	09/19/94
30 day public comment period ends	Public	Actual date completed	10/19/94
Army submits Final Interim ROD with Responsiveness Summary	EPA/ADEM	Actual date completed	10/24/94
EPA/ADEM/Army signs Final Interim ROD with responsiveness summary	All	Actual date completed	11/30/94
Army submits Draft RD/RA Work Plan	EPA/ADEM	Actual date completed	08/05/94
EPA/ADEM provides comments on Draft RD/RA Work Plan	Army	Actual date completed	10/31/94
Army submits Final RD/RA Work Plan	EPA/ADEM	Actual date completed	11/07/94
EPA/ADEM Provides approval for Final RD/RA Work Plan	Army	Actual date completed	11/17/94
Army begins RA	Army	Actual date completed	12/19/94
RA complete	Army	Actual date completed	07/01/98
Army submits Draft RAR Report	Army	Actual date completed	08/01/98
ADEM/EPA provides comments on Draft RAR	ADEM/EPA	60 days from submittal	10/01/98
Army submits Final RAR	Army	30 days from receipt of comments	11/01/98
Army submits Final Summary Report	Army	Actual date completed	5/19/00

ALABAMA ARMY AMMUNITION PLANT
STUDY AREAS 2,10,16,17,19 AN 22 INTERIM SOIL RESPONSE (AREA B OU4)
PROGRAMMATIC SCHEDULE

TABLE 8-6

ITEMS/TASKS	SUBMIT TO	DURATION	DATE
Army submits Draft Interim ROD	EPA/ADEM	Actual date completed	04/15/96
EPA/ADEM provides comments on Draft Interim Final ROD	Army	Actual date completed	07/22/96
30 day public comment period begins	Public	Actual date completed	9/15/96
30 day public comment period ends	Public	Actual date completed	10/15/96
Army submits Final Interim ROD with Responsiveness Summary	EPA/ADEM	Actual date completed	10/20/96
EPA/ADEM/Army signs Final Interim ROD with responsiveness summary	All	Actual date completed	01/24/97
Army submits Final Addendum RD/RA Workplan (explosive contaminated soils)	EPA/ADEM	Actual date completed	10/08/96
EPA/ADEM provides approval for Final addendum RD/RA Workplan (explosive contaminate soils)	Army	Actual date completed	11/08/96
Army begins RA for explosive contaminated soils	Army	Actual date completed	11/15/96
Army completes RA for explosive contaminated soils	Army	Actual date completed	01/18/97
RA for lead soils completed	Army	Actual date completed	
RA (Engineered cap) Area 22 begins	Army	Actual date completed	
RA (Engineered cap) completed	Army	Actual date completed	
Army submits RAR Report	Army	60 days after the end of RA	

**ALAAP SITE MANAGEMENT PLAN
FIGURES**

**ALABAMA ARMY AMMUNITION PLANT
PROJECT CLOSEOUT
FIGURE 8-A**

UPDATED: July, 2001

OPERABLE UNIT NUMBER: Area A, OU1

OPERABLE UNIT DESCRIPTION: Area A Soils and Groundwater

FY01 DELIVERABLES:

DOCUMENT

SUBMISSION DATE

Final delisting of the property is in process. No schedule for deliverables has been developed.

**ALABAMA ARMY AMMUNITION PLANT
PROJECT CLOSEOUT
FIGURE 8-F**

UPDATED: July, 2001

OPERABLE UNIT NUMBER: Area B OU4

STUDY AREA DESCRIPTION: Study Areas 2,10,16,17,19 and 22 Interim Soil Response

FY01 DELIVERABLES:

<u>DOCUMENT</u>	<u>SUBMISSION DATE</u>
Final closure report for Interim ROD	2001